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ABSTRACT

A literature review examined educational research on school reform and vocational and technical education. The first area examined student risk factors in education, the state of the art in secondary vocational education (career and technical education or CTE), and the interplay of these new forms of CTE and other comprehensive school reform efforts in high schools. The second area of the review examined reforms and other trends in postsecondary CTE, usually in community colleges. The review determined that the current state of the art of research includes limited evidence of improvement in outcomes such as student attendance and transition to postsecondary education. The review found that there is very little strong research on student outcomes, although school-level and non-experimental evidence appears to show positive outcome trends, and descriptive studies of current reform efforts give cause for cautious optimism regarding their ability to improve the education and life chances of at-risk students. Recommendations are made for specific elements of reform that appear to yield positive results when combined in a manner consistent with an individual school's context and needs. Some of these elements include high academic standards, sustained professional development, new forms of pedagogy and assessment, reorganization of the learning environment into smaller communities with a broad career focus, and partnerships with business and

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postsecondary institutions. The study concluded that further robust research efforts are badly needed. (Contains 190 references.) (KC)

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Career and Technical Education Reforms and Comprehensive School Reforms in High Schools and Community Colleges:

Their Impact on Educational Outcomes for At-Risk Youth

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Career and Technical Education Reforms and Comprehensive School Reforms in High Schools and Community Colleges: Their Impact on Educational Outcomes for At-Risk Youth

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Executive Summary

This literature review explores the intersection of several broad areas of education research. In the first section, we cover three areas within secondary education research: an examination of student risk factors in education; the state of the art in secondary vocational education, increasingly known as career and technical education (CTE); and the interplay of these new forms of CTE and other comprehensive school reform efforts in high schools. In the second section, we turn our attention to reforms and other trends in postsecondary CTE, usually located in community colleges. Our goal is to examine the effects that these reform efforts have had on outcomes for at-risk students. Because these are relatively independent strands in the literature, we have cast a wide net. We draw connections across the fields wherever possible, so as to explore ways to improve the education and life chances of students placed at risk of school failure or dropping out.

Section One of this report examines student risk factors in education; student-level, family-level, school-level, and community-level risk factors are discussed, with the conclusion being that students with any of these factors could be at risk of not graduating from high school. Students who attend schools where many of these factors exist have a greatly increased likelihood of dropping out. This research-based definition of at-risk students frames our subsequent analyses. Next, we examine whether school reforms in general, and CTE reforms specifically, have had any impact on schooling outcomes for at-risk students—achievement, attendance, course-taking, or transition to postsecondary opportunities.

We found little research that documented whether CTE reforms have influenced outcomes for at-risk students. A major reason for this is related to the shortage of hard evidence on overall student outcomes resulting from school reform efforts, so the subset of evidence for at-risk students is lacking as well. One finding of this literature review is that much more work needs to be done to empirically document the improvements that are heralded anecdotally, gathered internally within reform organizations, or noted in descriptive studies of secondary school reform.

Historically, vocational education programs tended to include those students who were at risk of not finishing high school. These were students whom counselors and other adults assumed would not go on to any postsecondary education, and they were provided with vocational education so that they could earn a decent living after leaving school. Such a use of secondary education has become problematic, as there is widespread agreement that some postsecondary education is very nearly a necessity for economic self-sufficiency. In most parts of the country, vocational education has begun to develop high-tech programs to meet new demands of businesses and industries.

However, although vocational educators promote career preparation goals as important for all students, in most cases vocational education has retained its reputation as a track for those not interested in or talented enough for college. For this reason, and due to the paucity of research information, we review known outcomes for the various vocational reforms, assuming that many of the students in these programs have been, in fact, at risk. We recognize that this is not exclusively the case, and we advocate for research that separates outcomes by student risk factors.

Section Two of this report reviews education reform in secondary schools from 1985 to 2001. We describe secondary school CTE-specific reform efforts that were driven by Federal legislation, such as tech prep and School to Work. Both of these initiatives have seen some success, although few manifestations of tech prep and School to Work incorporate all of the elements outlined in the legislation.

We then discuss efforts to develop career and technical education that exist without the aid of legislation. The High Schools That Work design attempts to ensure that students in vocational programs receive high-level academics in order to be eligible for postsecondary education, and structures such as career academies, career magnets, and career pathways attempt to provide all students with career exploration and experiences within a curriculum that also prepares them for college. Despite the relative newness of these initiatives, the mounting anecdotal evidence suggests that they are having positive effects on at-risk student attendance, course-taking patterns, and transition to postsecondary education. However, there is little substantive research validating the claims of reform advocates, demonstrating the need for more rigorous research, especially on elements of these reforms such as contextualized learning, curriculum integration, and career pathways.

Next, we describe the comprehensive school reform movement. Although there have been calls for reform at nearly every point in the history of American education, the most recent wave stands apart by virtue of the level of national support for reform (e.g., the Comprehensive School Reform Demonstration [CSRD] initiative), and the remarkable growth of specific designs. Various organizations have developed, marketed, and delivered comprehensive school reform designs to schools across the country. We briefly describe examples of these designs, such as Talent Development High Schools, Urban Learning Centers, and the New American High Schools initiative, all of which are being implemented in high-poverty areas. As with reform efforts stemming from CTE, there are studies indicating increased attainment of goals such as a decrease in dropouts and an increase in secondary and postsecondary attendance. Some studies suggest improved academic achievement as well, but methodological problems with such studies remain, such as a reliance on internal research. We call for a stronger research base to help schools, districts, and policymakers decide whether a particular reform design might be useful in their context.

The last part of our review of secondary school reform describes efforts in which CTE reforms have been integrated with comprehensive school reform. To date, these studies have been descriptive, and we note the need for more research on this type of integrated reform approach. Such research should include disaggregated outcomes data so that the impact on at-risk students is clear. We conclude this section of the review with a summary of the characteristics of sustainable reform, and recommendations for activities and efforts that integrate CTE and whole school reform at the secondary level.

Section Three of this report focuses on CTE-based and broader reforms at the community college, the site of postsecondary career and technical education. It is just as important to examine outcomes for at-risk students at the community college level as it is at the high school level for two reasons. First, many at-risk students who continue their educations do so in pre-baccalaureate institutions, variously known as 2-year colleges, junior colleges, technical colleges, and community colleges. Second, a general consensus exists today that some postsecondary education is necessary for economic self-sufficiency, thus attempts to improve the

life chances of at-risk students must include an examination of career and technical education at the community college level.

There is little empirical research at the postsecondary level on outcomes for at-risk students. One problem is nomenclature: if students are attending a community college, they have graduated from high school and are no longer "at risk" in the sense of "at risk of failing to graduate high school." However, poor and minority students are at risk of failure at a later stage: that is, failure to complete their postsecondary studies. A second difficulty in determining outcomes for community college students is that many of them "stop out," or discontinue their studies for a time. Students may resume their education at a different institution, making outcomes difficult to track. Finally, community colleges have evolved differently in different regions of the country, and states have widely varied governance structures for them. While the same can be said to a lesser extent for the nation's high schools, it is easier to draw conclusions about the state of secondary education than about the state of community colleges. In addition, there is no institutionalization of "reform designs" for community colleges as is the case for secondary schools. There are national trends, which we review, but community colleges lack the strong research, development, and technical assistance infrastructure that the K-12 system enjoys.

In summary, the current state of the art includes limited evidence of improvement in outcomes such as student attendance and transition to postsecondary education. This literature review finds that there is very little strong research on student outcomes that intersects at least three of the four broad areas reviewed. However, school-level and non-experimental evidence appears to show positive outcome trends, and descriptive studies of current reform efforts give cause for cautious optimism regarding their ability to improve the education and life chances of at-risk students. Our schools and community colleges have a great need for robust studies of high school CTE reforms, whole school reforms, and their intersection. There is a particularly pressing need for studies located in areas with low income, high minority, or high limited English proficient (LEP) populations.

We provide recommendations on specific elements of reform that appear to yield positive results when combined in a manner consistent with an individual school's context and needs. Some of these elements include high academic standards, sustained professional development, new forms of pedagogy and assessment, reorganization of the learning environment into smaller communities with a broad career focus, and partnerships with business and postsecondary institutions.

The report concludes with a section on implications for further research and practice. The field is badly in need of a set of overlapping studies of diverse efforts in school reform. These studies should be longitudinal, and they should take advantage of naturally occurring contexts. Funding should be increased for these research efforts in order to move the field to a more data-informed level. With respect to the practice of reform efforts within schools, school administrators need to enhance interdepartmental collaboration, to provide joint professional development across traditionally separate areas of the school, and to incorporate career-based learning into more secondary schools. High schools should consider external partners to provide technical assistance in reform and to seek out ways to conduct research on their reform efforts.

Finally, the postsecondary education system should increase pedagogical and other reform efforts. The reform and accountability movement that has swept the K–12 system is only now beginning to touch postsecondary education, and community college leaders need to acknowledge, support, and disseminate innovative practices throughout the system, or risk seeming anachronistic.

The research task ahead is large, but these reform elements must be tested to see whether they indeed make a difference in the lives of at-risk students. Their numbers are growing, and their calls for equal opportunity must be met if we are to live up to our nation's ideals.

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INTRODUCTION

This review of research examines the impact of various types of education reform on outcomes for at-risk students. We cover four broad areas within the field of education research: we begin with an overview of student risk factors in education; we describe the state of the art in secondary vocational education, increasingly known as career and technical education (CTE); we examine the interplay of these new forms of CTE and other whole-school reform efforts in high schools; and we consider reforms and other trends in postsecondary CTE, usually at the community college level.

School reform is a perennial issue in American education. At the turn of the 20th century, John Dewey (1900, 1916) provided reasons to be concerned with educational improvement, two of which continue to stand out at the dawn of the 21st century—furthering democratic ideals through a broadly educated citizenry, and obtaining a viable economic future for all of our citizens.

Formal education is society's best available route to assure citizens' participation in the world of work. The relationship between education and income has never been stronger than in the closing years of the 20th century. Figure 1 presents the income (in inflation-adjusted 1998 dollars) of young U.S. males over the past 50 years by education level.[1] These data indicate that a young male college graduate has roughly the same inflation-adjusted income as his young male college-graduated peers as far back as 1960. He earns more than one-and-a-half times what an equally educated young male earned at the mid-point of the 20th century. By contrast, today's young male high school dropout not only earns less than half as much as the average high school dropout of 25 years ago (in inflation-adjusted dollars), he actually earns less, in constant dollars, than did young high school dropouts of 1949, a half-century ago.

Figure 2 presents some of the same data slightly differently. For a young male, the economic advantage of a college degree in 1949 was 13% greater than that of a high school degree, and 30% greater than dropping out of high school. By 1973, those differences had grown to 20% and 46%, respectively. However, the entire spectrum had risen so much that the average young high school dropout was making more than the average college graduate of only 24 years earlier, so that the effect was hardly noticeable for the individuals concerned. By 1998, the picture had changed dramatically. Not only was the real income of a young high school dropout down by 52% since 1973, but the differential in income by education level had increased from 30% to 138%. In other words, the economic advantage of obtaining a college education today is over four times as great as it was a half-century ago.

[1] All data are from U.S. Census Bureau "March Reports," various dates, and reprinted from Stringfield (1995, 2001), with permission of the author. A somewhat similar picture is available for young adult females. However, the fact that the percentage of young women in the formal workforce has moved from approximately 25% to 80% in one generation makes such longitudinal comparisons problematic.

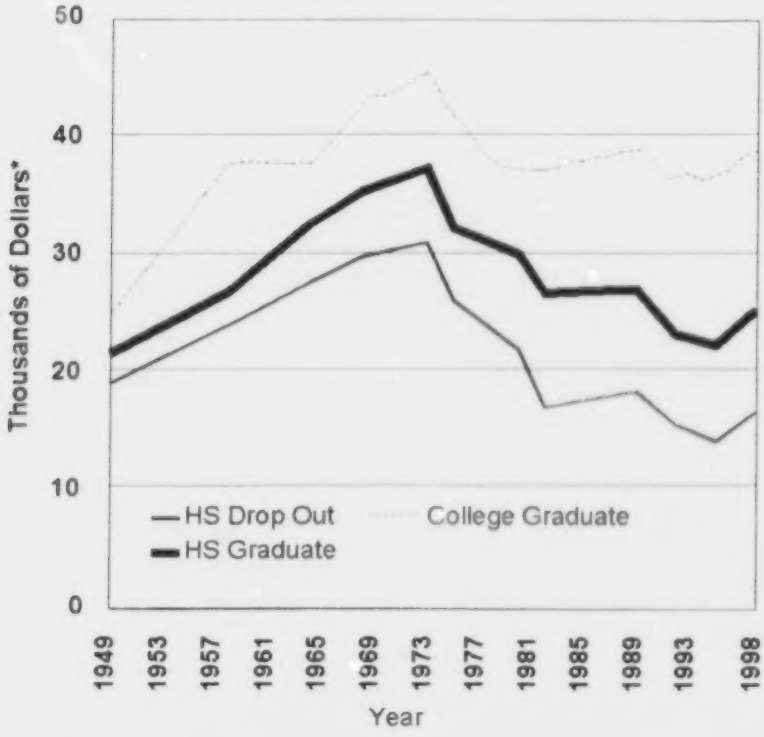

Figure 1. Median income of U.S. males aged 25–34, by educational level, 1949–1998.

*1998 dollars (CPI-U adjusted). Source: U.S. Census Bureau

In the emerging world information economy described by Friedman (1999), there is an increasing premium for obtaining further formal education. The U.S. Department of Labor (2000) notes that the education level expected to see the most rapid growth in job prospects over the next 10 years is the associate degree, followed by the bachelor's, doctoral, and master's degrees. All jobs requiring less than an associate degree are expected to have lower percentage increases in job growth.[2] The clear conclusion of the work of the U.S. Department of Labor is this: "Education is essential in getting a high-paying job" (p. 2).

[2] The exception to this generally dramatic trend includes people with specific, generally quite technical skills, such as personal computing/networking skills.

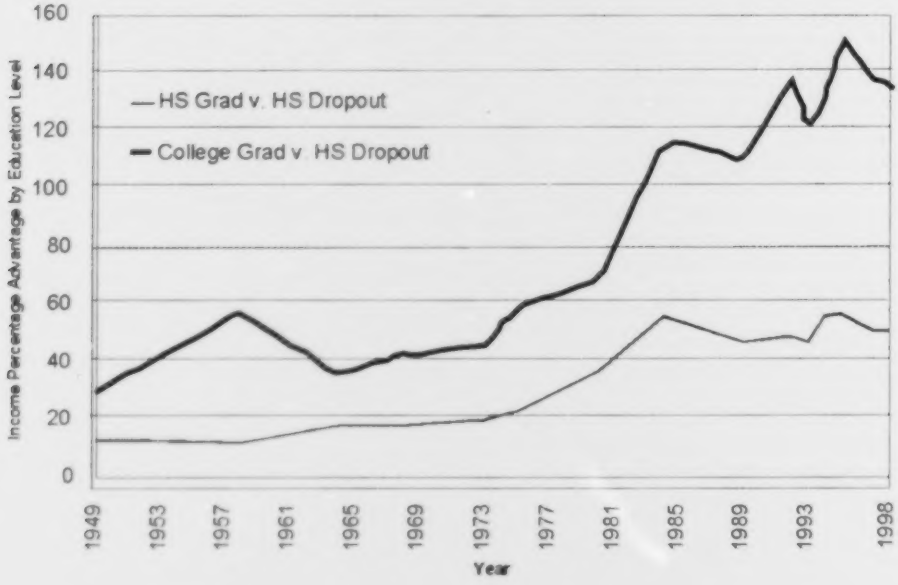

Figure 2. Median income advantage for 25–34-year-old males as a result of additional educational attainments, 1949–1998.

*1998 dollars (CPI-U adjusted). Source: U.S. Census Bureau

This relationship between education and income is established by young adulthood for most people. As Murnane and Levy (1996) document, "The widening earnings gap between high school and college graduates stems in large part from differences in the mastery of basic skills *when the two groups were high school seniors*" (p. 8, italics in original). What are these "new basic skills"? Murnane and Levy (1996) list nine:

1. reliability;
2. positive attitude;
3. a willingness to work hard;
4. ninth grade or higher mathematics abilities;
5. ninth grade or higher reading abilities;
6. the ability to solve semi-structured problems at levels much higher than today's high school graduates;

7. the ability to work in groups;
8. the ability to make effective oral and written presentations; and
9. the ability to use personal computers to carry out simple tasks such as word processing.

Murnane and Levy (1996) argue emphatically that the majority of these skills are not being taught to most U.S. high school students today.

As a nation, we do not yet have valid, reliable ways of measuring student performance on many of these "new basics." However, we do have longitudinal measures of how well we are teaching some of the more academic skills. The National Assessment of Educational Progress (NAEP) provides data in several of these areas, including reading, mathematics, and science (see Figure 3, adapted from Campbell, Hombo, & Mazzeo, 2001). Whereas large sample sizes ($N >$ 10,000 in each cell, at each point in time) make it possible to find statistical significances among the various trends at different points in time, all nine of the trends (the three subjects by the three ages of 9, 13, and 17) have in fact been stable over the past 30 years. Among the three reading trend lines, for example, only one data point (age 13 in 1990) was significantly different in 1999 from 1980, and that significance disappeared in the 1992 round of testing.

In mathematics and science, all six lines are up slightly from 1982, but the age 17 science score is actually below the mean score of 1969. Mathematics would appear to be the area with clearest long-term gains, since in science none of the increases are significantly higher than in 1994. Despite these anomalous fluctuations, it is hard to look at the nine trend lines in Figure 3 without concluding that each is essentially flat.

In summary, census data indicate that failure to get at least a high school diploma creates increasingly high hurdles for young people seeking economic sufficiency in adulthood. The Murnane and Levy (1996) analyses suggest that the income-by-education level differentials are partially explained by achievement differences observable in the senior year of high school, and the NAEP data indicate that age 17 achievement has been largely flat over the last 30 years. The quality of education has not increased, but the failure to thrive educationally is producing increasingly difficult economic circumstances for students.

Two logical goals can be derived from the above. One goal is to help the largest possible percentage of people prepare for and succeed in 4-year postsecondary careers. There are not enough slots in our colleges and universities for all high school graduates, nor do all students wish to attend 4-year colleges. This leads to the second goal—to educate the largest possible percentage of young people who do not attend a 4-year college[3] with a high-quality combination of (a) general education for participation in a democratic society, and (b) the technical skills necessary to succeed economically in a world information economy. This translates to reducing the number of dropouts and increasing student achievement in high school, both of which are among the goals of most current secondary school reform efforts.

[3] In 1999, 37% of all high school graduates did not enroll in any college in the autumn after their graduation. 21% of the total enrolled in a 2-year college, and 42% enrolled in a 4-year college program (U.S. Department of Education, 2001, table 381). Thus 58% of the 1999 high school graduating population did not enter a 4-year degree program.

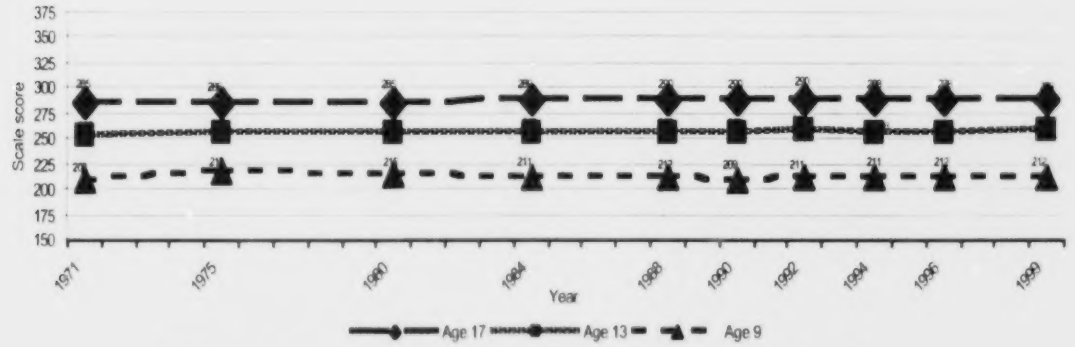

Figure 3a Reading performance: Average reading performance, by age, 1971—1999

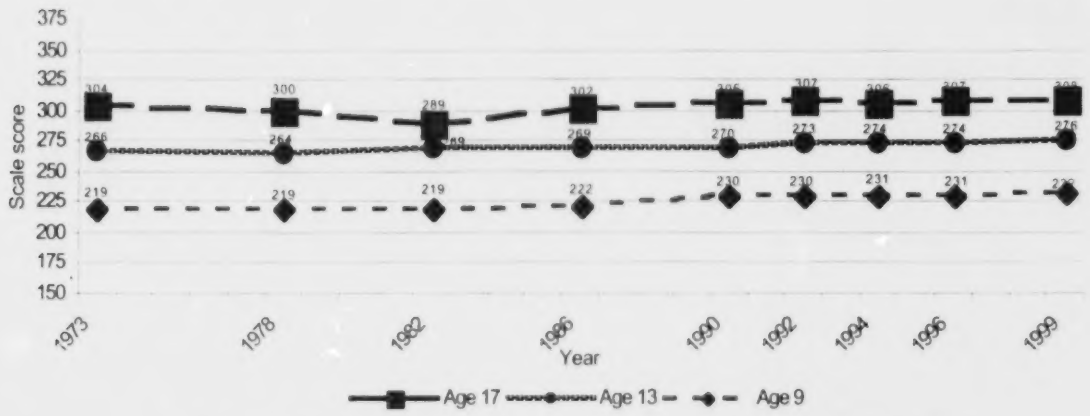

Figure 3b. Mathematics performance: Average mathematics performance, by age, 1973—1999

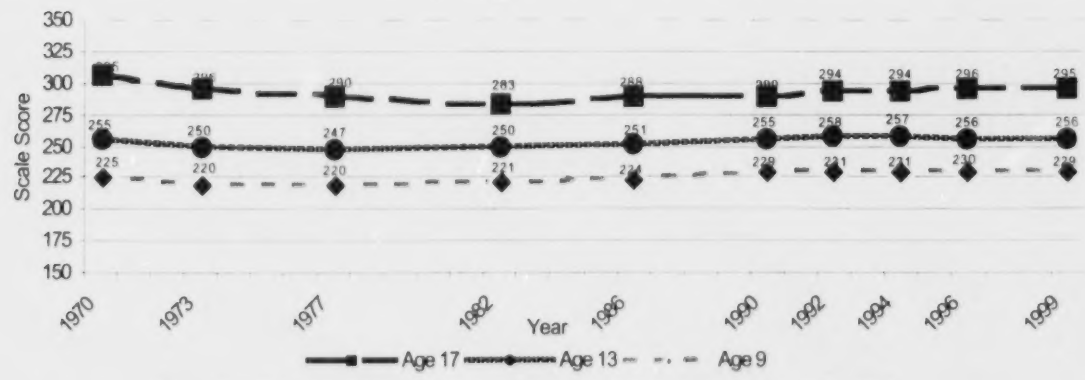

Figure 3c. Science performance: Average science performance, by age, 1970—1999

Figure 3a–c. Trends in average scale scores for the U.S. in reading, mathematics, and science.

SECTION ONE: STUDENT RISK FACTORS IN EDUCATION

Part of what is necessary for our nation to address dropout and achievement problems is to gain an understanding of the factors that contribute to school failure. A variety of studies have indicated that poverty, minority status, parents' educational attainment, and other variables beyond the control of students have tended to lead to low achievement and failure to thrive in schooling (Land & Legters, in press; Natriello, McDill, & Pallas, 1990; Puma et al., 1997; Weis, 1988). Nora and Rendon (1988) found that even among those at-risk students who successfully complete high school, community college completion rates are low. The number of students in these categories is expected to rise in comparison to White, middle-class, native English speakers whose parents attended college (Hodgkinson, 2000). This section reviews the research on individual- and community-level characteristics that appear to place students at relatively greater risk of educational failure.

"Risk factors" in education commonly refer to situations or characteristics that may have an impact on the likelihood that a student will graduate from high school (Slavin, Karweit, & Madden, 1989). Although the U.S. Department of Education's National Center for Educational Statistics (NCES) has been unsuccessful in its efforts to get 50 states to agree on a common definition of "dropout," the best available data indicate that approximately 11% of U.S. students between the ages of 16 and 24 are out of school and have not completed high school (Kaufman, Kwon, Klein, & Chapman, 2000).

A large number of variables have been shown to correlate with dropping out of school. However, with the exception of the variable, "attending a very high-poverty, non-selective urban high school" (Balfanz & Legters, 2001), no combination of these has been shown to be strongly predictive of dropping out. Many students encountering these variables, even several at one time, are able to successfully complete both high school and college. Therefore, it is important to note at the outset that no one correlate, or set of correlates, necessarily destines a child or group of children to failure. (See, for example, the large literature on "resiliency": Borman & Rachuba, 2001; Finn & Rock, 1997; Taylor & Wang, 2000; Waxman & Padron, 2001.) Discussions of risk factors typically are divided into four levels: the individual; the family or home; the school; and community/societal variables. Each will be discussed below.

Individual-Level Risk Factors

A large number of variables have been found to be associated with individual-level risk of educational failure: Natriello et al. (1990) noted that limited English proficiency was a significant risk factor. Stevens and Price (1992) listed prenatal drug and alcohol exposure, premature birth, HIV infection, lead poisoning, and the experience of abuse and homelessness as significant risk factors. Dynarski and Gleason (in press) conducted an extensive review of research on "risk" and added the following student-level variables: student has an external locus of control; low self-esteem; is not "very sure" of graduating from high school; has one or more children; was absent 20 or more times per year; is more than one year behind in school; received low grades (C's and D's or below); has had disciplinary problems at school; has attended five or more schools; spends less than an hour per week on homework; and spends no time reading for fun. In fact, because academic difficulty as early as the third grade has been shown to predict

later dropout rates, academic progress in the elementary and middle grades should also be considered a schooling "risk factor."

A significant problem identified in the Dynarski and Gleason (in press) research is that, in spite of having data available on a total of 18 student-level variables, and being able to combine those into four composite risk variables, the authors were unable to produce a student-level composite variable that could predict later dropout behavior with near 50% accuracy, and very often incorrectly identified as likely dropouts students who, in fact, graduated from high school. The presence of high rates of both "false positives" (students statistically identified as likely to drop out who in fact go on to graduate on schedule) and "false negatives" (a failure to correctly target other students as likely to drop out who do, in fact, drop out) is a serious limitation of current student-level risk identification programs.

Race/ethnicity is a special case. Race is a complex variable for the purposes of categorization of risk factors. Being African American or Hispanic increases one's statistical chances of dropping out of school; however, some of the reasons for these statistical changes may operate at an individual level, others at a family level, others at a school level, and still others at a community/societal level.

Regardless of the level at which it is discussed, the fact remains that minority students are much less likely to thrive in public schools. Campbell et al. (2001), for example, found that on the 1998 National Assessment of Educational Progress (NAEP), African American students scored 28-32 points lower than White students, and Hispanic students scored 22-26 points lower than White students. Using U.S. Census Bureau data, Kaufman et al. (2000) concluded that the percentages of people between the ages of 15 and 24 who had neither completed high school nor attended school in 1999 was 12.6% for Blacks, 28.6% for Hispanics, and 7.3% for Whites.

Family-Level Risk Factors

Natriello et al. (1990) identified poverty, mother's education, and family composition as family-level indicators of risk. From the Coleman Report (1966) forward, being from a high-poverty family has been a predictor of failure to thrive academically. For example, the 1998 NAEP found that students receiving free or reduced-price lunch scored lower than non-free-lunch students (Donahue, Voelkl, Campbell, & Mazzeo, 1999). Kaufman et al. (2000) reported that the single-year dropout rate for students whose families were in the bottom 20% of the income distribution was 11% in a single year, compared with a 2.1% dropout rate for students whose families were in the top economic quintile.

Mothers' education level has been found to be a consistent predictor of students' failure to thrive in public education.[4] Parents who themselves lack a high school education may not be as prepared to help their children complete their homework or navigate the experience of secondary school (Land & Legters, in press). In addition, immigrant parents often do not understand the U.S. schooling system, and may not be aware of opportunities available to improve their children's achievement.

[4] More studies focus on mothers' education levels, as opposed to fathers' education levels, in part because in the case of single-parent families, the child is more likely to live with the mother.

On average, students living in single-parent families do less well on standardized tests. Using 1988 NAEP data, Natriello et al. (1990) estimated that third-grade students from single-parent families were already a year behind those from two-parent families. Furthermore, students from single-parent families are more than twice as likely to drop out of school as students living in two-parent families (Kaufman, McMillen, & Sweet, 1996). This is in part because single-parent family status tends to be associated with other "risk-related" variables such as poverty and minority status. Over a quarter of U.S. children under the age of 18 live in single-parent families, with over 80% of these living with their mothers.

School-Level Risk Factors

Poverty concentration, class size, and school size are all associated with lower rates of academic success. U.S. Department of Education (2000) analyses of 1996 NAEP data indicate that, on average, nine-year-old children attending schools in which 75+% of students received free or reduced-price lunch scored 37 points lower in reading and 21 points lower in mathematics than nine-year-old students attending schools with 25% or lower free or reduced-price lunch. Balfanz and Legters (2001) examined the characteristics of high schools from which less than half of all students graduated. The most unifying of all relatively common characteristics was very high school-level rates of poverty.

Both large class size and school size also appear to be detrimental to students' achievements. The Tennessee Project STAR was an experimental study of class size. Nye, Hedges, and Konstantopoulos (1999) found that in the Tennessee study, smaller class sizes (13–17 students) produced higher achievements in the primary grades, particularly for racial and ethnic minority students.

Similarly, Lee and Smith (1997) analyzed school size data, using the nationally representative NELS:88 database. They found that attending a very large school was detrimental to students' academic growth. Their analyses concluded that the most academic-enhancing schools tended to have between 600 and 900 students. Cotton (1996), in analyses limited to secondary schools, came to a very similar conclusion.

Community-Level Risk Factors

School location is a significant predictor of students' probability of thriving in school. Grissmer (2001) found that, regardless of section of the country, attending an urban school negatively affected a student's probability of academic success. Balfanz and Legters (2001) found that virtually all of the U.S. high schools with less than a 50% graduation rate were located in inner-city districts. The reasons are fairly well-known: inner-city schools tend to have less prepared teachers and less funding than their suburban counterparts. In addition, Grissmer (2001) found that, all other things being equal, students attending schools located in the Northeastern and North-Central states outperformed students in the Southeastern and Western states.

In summary, there are student-, family-, school-, and community-level risk factors of school failure. In general, students who have been exposed to such clear risk-inducing conditions as suffering from low self-esteem, coming from high-poverty backgrounds, being members of racial/ethnic minorities, whose parents are poorly educated, and who attend large schools with large classes in high-poverty, inner-city contexts are more likely to do poorly in school. Those

same students are more likely to eventually drop out. As Balfanz and Legters (2001) demonstrated, in the extreme case, students attending schools where many of the above factors are concentrated have a less than 50% probability of graduating from high school. Such a state of affairs calls out for reforms to attend to the risk factors that can be addressed.

SECTION TWO: EDUCATIONAL REFORM IN SECONDARY SCHOOLS, 1985-2001

Although the broad topic of school improvement has rarely left the American agenda, the current school reform movement can be traced to the release of a series of commission reports during the 1980s and early 1990s that decried a "rising tide of mediocrity" in American schooling (National Commission on Excellence in Education, 1983). These reports warned that inattention to shortcomings in the education of young Americans would lead to a generation of underprepared adults unable to sustain a vibrant U.S. economy (Commission on the Skills of the American Workforce, 1990). The various commissions indicated that the nation was in danger of losing ground economically to other developed countries (Johnston & Packer, 1987). They enumerated specific skills that employers claimed to be looking for in workers, which included not only basic skills, but also so-called "soft skills" (Murnane & Levy, 1996), such as reliability and a positive attitude. The argument was that American jobs were becoming "high performance," but its labor force was not.

Many of the reports recommended school reform that set tougher standards and focused on the acquisition of basic skills (National Commission on Excellence in Education, 1983; U.S. Departments of Labor and Education, 1988). As a result, education reform became defined in some circles as raising standards and increasing graduation requirements. Traditional academic skill improvement was the clear goal.

These reforms of the late 1980s neither improved student test scores (as measured by age 17 NAEP), nor increased high school graduation rates. Furthermore, the extra time devoted to academic courses took time away from student electives, often including vocational education. In fact, vocational education had remained peripheral to the national debate. But during this time, many members of the vocational education community were rethinking their mission. Historically, the vocational track had tended to be sparse in academics, and the business community began to complain that students were coming to them without being fully prepared for work. Another commission report described the neglect of this "forgotten half":

> Our economy is being damaged, and more importantly, young lives are being damaged, by our collective failure to help young people make a smoother transition from school to work (William T. Grant Foundation, 1988, p. 39).

The Grant Foundation report, together with other events, prompted school reform that had workforce preparation as a focus, including improving school-to-work transitions and a focus on obtaining postsecondary education as a preparation for careers (Boesel & McFarland, 1994; Parnell, 1985).

So both the broader secondary education community, and the vocational education community within it, were rethinking their roles and structures at the same time. This provided an opportunity for dynamic intersections that integrated academic rigor with preparation for work (broadly defined) for all students. In the following pages, we outline the direction that vocationally-based reforms have taken, then we describe the comprehensive school reform movement that in some cases overlooked the entire vocational part of the school and of students' developmental needs. We follow that with an examination of those reform efforts that attempt to integrate rigorous academics with career information and preparation.

All of these efforts are examined through the prism of improving education for the most disadvantaged students in society—the poor, minorities, students at risk of failing or dropping out, and students for whom English is a second language. While we recognize that not all vocational students are at-risk students, we also acknowledge that the vocational track is where many students who are not expected to attend 4-year colleges are located.

Additional points are relevant. First, vocational programs are changing. They may be attracting higher-achieving students who recognize the value of the kinds of introduction to careers that many career and technical programs offer. Second, little data exists on student outcomes in career and technical education (CTE) programs in general, and on outcomes for at-risk students within CTE programs specifically. Thus, one of our conclusions is that much more empirical work needs to be done to document outcomes of the various reform efforts reviewed here. Given this shortage of information on student outcomes, we will review the reform efforts more generally, and relate our recommendations to those program elements that are considered helpful in engaging and improving the achievement of at-risk students.

Career and Technical Education Reform

Vocational education as a part of public schooling began in the U.S. in the 19th century. Previously, public secondary schools had been designed to serve a small percentage of students completing elementary school. Most children were expected to learn a trade in the traditional apprentice fashion, by the side of a family member, farmer, or craftsman. When compulsory schooling extended into the teen years, students began to be sorted by likely outcomes. The sorting itself tended to ensure a "practical" (i.e., local economy directed) education for the great majority of students, and effectively ensured the marginalization of vocational education (Kincheloe, 1995).

Historically, vocational education programs tended to include those students who were at risk of not finishing high school (Thompson, 1973). They were students whom counselors and other adults assumed would not go on to any postsecondary education. These students were provided with vocational education so that they could earn a decent living after leaving school. Although vocational education in the U.S. did not enjoy high status, it did prepare generations of young people for the work roles that awaited them in factories, farms, and offices. Vocational education succeeded at this mission as long as there were enough jobs in these areas, but such a use of secondary education has become problematic. Since the end of the 1980s, the globalization of the economy has had an increasing impact on the American economy. Between 1970 and 1993, the proportion of U.S. workers employed in manufacturing fell 41%, down to only 16% of the total workers employed (Feuer & Shavelson, 1996). This has happened in many sectors, from steel and automobiles to household goods and apparel. The old expectation that a young person could get a job in the plant where one's father had worked no longer held. In fact, many fathers were unable to keep those jobs themselves.

During the 1980s and 1990s, vocational education enrollments declined in traditional vocational content areas—business, agriculture, and the trades (Levesque et al., 2000). The vocational education community began to feel the pressure to adapt or risk becoming irrelevant in the 21st century economy. Most of the traditional areas needed to be infused with new technologies—computerized diagnostics in auto repair, numerically controlled machines in machine shops, and high-tech equipment in health occupations classes. Clearly, for those

changes to happen, staff would need professional development on these new technologies as well. High schools needed to provide a more expansive academic and vocational curriculum premised upon broad career clusters, rather than preparation for particular jobs. Such programs needed to become better linked to postsecondary occupational education, which, in turn, could provide greater specificity and more direct application to immediate employment. These programs could also point to further postsecondary education and workplace training opportunities over a lifetime.

To reflect this change in philosophy and the kinds of programs offered, in 1998, the American Vocational Association changed its name to the Association for Career and Technical Education. The new ACTE urged its members to use the term "career and technical education" (CTE) in place of "vocational education" (Lynch, 2000). The most important changes were a focus on increasing the academic skills of CTE students, on trying to erase the stigma attached to vocational education, and on having all students meet the higher standards that had become prevalent. The goal of CTE became for all students to finish high school prepared to either enter the workplace (which had come to demand strong academic skills and other "new basic" skills), or to go on to postsecondary education. This broader mission challenged vocational educators to teach beyond the confines of specific occupations, and instead to prepare students for a more demanding world of work.

Stone (2000) summarized this expanded view of CTE in which students are prepared for the contemporary workplace along three non-exclusive vectors: education that uses work as a context for developing broader general skills, education that uses work as a context for developing more widely recognized skills required for long-term occupational and career success, and, education that uses work as a context for developing occupationally specific skills. These can be referred to as education *through* work, education *about* work, and education *for* work.

Education Through Work

All students should have the opportunity to learn school subjects with work as the context of their learning. Dewey called this "education through occupations" (1916, p. 309). Work-based learning and "the new vocationalism" (Grubb, 1995a; Ramsey, 1995) are other descriptors. Wirth (1992) interpreted Dewey's terminology in the following way:

> Dewey perceived the occupations, then, in the broad sense as those activities that occupy men and women in coping with life. Education through occupations meant for Dewey an activity that engages the intellect in reflection upon actual practical activity—the shared practices of the community that are the roots of human learning. (p. 182)

Stone (1995) described ways in which workplace learning could be harnessed to reduce the skills gap—especially in urban locations. He pointed to opportunities in the community, such as cleaning up crumbling buildings and meeting the needs of children and the elderly, that had work/learning potential. Communities abound with work/learning opportunities, and these have power to transform the entire curriculum. In this way, all teachers in elementary and secondary school can become involved in career and technical education. All teachers are needed in this interdisciplinary endeavor, as Stern and Rahn (1995) noted, "because most real-world problems do not fit neatly within the bounds of any one subject area" (p. 39).

Education through work and occupations draws upon the work of cognitive scientists who provide evidence that practical pursuits can be an important context for academic learning. Thus, situated or social learning can be the basis of cognition (e.g., Brown, Collins, & Duguid, 1988; Resnick, 1987; Lave, 1988).

Education About Work

Career and technical education can teach about work. Education about work, like education through work, is meant to be broadly educational. The curriculum assumes that career and technical knowledge—knowledge about the world of work—is valid school knowledge, good in its own right, and rightfully belongs in the common core of knowledge that all students should possess (e.g., Goodlad, 1984; Lewis, 1993, 1998). Workplaces are a primary site of the construction of culture, since people spend so much of their lives at work. Thus, what transpires in the workplace constitutes content worthy of a place in the school curriculum.

All students need to learn about social aspects of work, such as democratic rights in the workplace, safety, and the prospect of race or gender discrimination. They need to know about career ladders, labor markets, job-seeking skills, and job-keeping skills. They need to understand firsthand why some jobs are considered "better" than others. They need to understand how to effectively allocate resources, acquire and use information, develop solid interpersonal skills, use and troubleshoot technology, and work with and modify systems used in business and industry (Secretary's Commission on Achieving Necessary Skills [SCANS], 1991).

All teachers, but particularly specialist career and technical education teachers, can be involved in this aspect of the subject. There is much room here for collaboration between academic and vocational teachers. Classrooms and laboratories (such as technical labs or technology education labs) in schools and colleges are well-suited to provide education about work, whereas partnerships with actual work sites would be the ideal way to provide education about work.

Education For Work

Education for jobs in the economy is a vital aspect of career and technical education. Although many argue that preparation for jobs should probably be concentrated in the postsecondary phase of students' lives (e.g., in community and technical colleges), there are many students who are developmentally ready to prepare for occupations at earlier ages. Programs for these students, often located in regional vocational centers, must meet the two goals of rigorous academic development and rigorous career development. These programs must also link to postsecondary education and training opportunities. For most young people, however, secondary schools should provide high-quality career guidance services and competence in communication, numeracy, literacy, and computer abilities, all of which lead to more specific preparation at the postsecondary level.

The following reforms in the field of secondary vocational education represent a gradual movement toward the framework outlined above. First, we describe those CTE reforms that were driven by federal legislation; then we discuss reform efforts unrelated to legislative mandates.

Legislation-Driven Career and Technical Education Reforms

Much of what occurs in U.S. high schools is shaped by state laws and local programs. However, since the passage of the Smith-Hughes Act in 1917, the Federal government has been involved in the provision of vocational education to U.S. youth in high schools. As the commissions cited above issued their critiques on the state of U.S. education in the 1980s, the U.S. Congress responded in the reauthorizations of its vocational education laws. Congress' reauthorizations encouraged reforms of vocational education to make a clearer transition to postsecondary education, to infuse more academic rigor, to include more work-related experiences, and to make vocational education more accountable.

Perkins II

In 1990, the Carl D. Perkins Vocational and Applied Technology Education Act ("Perkins II") mandated that Federally funded vocational education programs institute several reforms. These included the following:

1. the development of tech prep programs;
2. the integration of vocational and academic curricula;
3. the promotion of work-related experience; and
4. accountability as a required element of funding.

In addition, Perkins II resources were to be targeted at "special populations"—the poor, the disabled, and those with limited English proficiency. Although many schools implemented some or all of the elements in a unified fashion, each of the four main elements is discussed separately in the paragraphs that follow.

Tech prep. As a corollary to the commission reports and the unsuccessful reforms that flowed from them, the needs of the "neglected majority" (Parnell, 1985) began to re-enter public debate. Parnell noted that most students left high school unprepared for either work or further education, and proposed a "2 + 2" program of study, incorporating the last two years of high school and the 2-year community college associate degree as a means of preparing students for increasingly technologically sophisticated jobs. He advocated a high school foundation of academics in applied settings, such as math, science, and communications, along with a sequenced set of technical courses coordinated with postsecondary institutions. Such programs were to be directed at students in the middle range of school performance.

As part of the Perkins II legislation, the U.S. Congress authorized the development of such technical preparation, or "tech prep," programs and provided funding for them. Most community colleges were already involved in some type of collaboration with high schools prior to Perkins II (Prager, 1994).

The key elements of tech prep as defined in the Perkins II legislation were:

1. an articulation agreement—a formal arrangement aligning curricula—among tech prep consortium members, such as school districts and community colleges;
2. 2 years of secondary and 2 years of postsecondary education (or apprenticeship) leading to a degree or certificate;
3. a common core of required proficiency in math, science, and communications;
4. technical preparation in specified occupational fields; and
5. placement in employment (Boesel & McFarland, 1994).

The goals of this structure were to attract students by eliminating repetition between high school and community college courses, and by showing students a clear path to postsecondary education and technical occupations. Tech prep also allowed community colleges to teach the more advanced courses thought to be necessary for highly technical occupations, on the assumption that students had taken the foundation courses in high school.

One issue that tech prep consortia had to deal with was the purposefully vague definitions of articulation, curriculum integration, and performance measures (Bragg, 2000). This was done to encourage the creation of systems that responded to local needs. It had the further effect of contributing to the slow development of those systems, because there were few models upon which to base efforts (Hayward, Dornsife, Bragg, Hoerner, & Clowes, 1998). Advocates of tech prep have also had to address the lingering reticence that academic teachers, parents, and students feel toward vocational education.

By the mid-1990s, tech prep systems had been implemented in over half of the comprehensive high schools and the majority of community colleges in the U.S. (Bragg et al., 1997; Levesque et al., 2000). Several studies have addressed this implementation process (Bragg, 1999; Bragg, Puckett, Reger, Thomas, & Ortman, 1997; Bragg & Layton, 1995; Hayward et al., 1998); however, none of the studies include student outcomes.

Bragg (2000, 2001) began a longitudinal study in 1998 of eight tech prep consortia that were considered "mature implementers." Due to large differences in implementation across sites, she did not aggregate results over the eight consortia, but rather described the ranges of outcomes. Bragg (2001) found that minority student participation in tech prep ranged from under 10% to about 85% of students in these consortia, reflecting the overall school populations in these communities. Among low-income students (i.e., family income less than $30,000 per year), tech prep participation ranged from about 17% to 59%. In three of these consortia, these numbers reflected a slightly higher tendency for low-income students to be in a tech prep program than their upper-income counterparts. Among all tech prep participants across all consortia, between about 17% and 75% went on to 2-year colleges, and between about 5% and 53% went on to 4-year colleges. Future reports from this study are scheduled to disaggregate these postsecondary transition outcomes by demographic characteristics and should shed more light on tech prep outcomes for at-risk youth.

A second evaluation of tech prep found that consortia often implemented various components of tech prep, but did not always strongly emphasize a smooth transition from high school to postsecondary education (Hershey, Silverberg, Owens, & Hulsey, 1998). Hershey et al. (1998) concluded that tech prep was not having the impact it was designed to have. One reason for this was that parents and students often balked at strictly defined sequences of courses explicitly preparing students for a postsecondary education at the local community college. Only 10% of consortia were found to follow such a strong course sequence, because it appeared to dismiss the possibility of attending a 4-year college. Thus, they found that over half of the tech prep initiatives consisted of applied academics courses targeted at vocational students, without explicit mention of the link to community college. The authors called this form of tech prep "enhanced vocational programs" (p. 83). Similarly, the remaining tech prep initiatives in the evaluation were not comprehensive programs with specific career emphases. Rather, they emphasized articulation, or career guidance, or applied academics, but not all tech prep components at the same time.

Instead of taking advantage of the articulated courses and continuing with more advanced coursework at the community college, students were found to be retaking the articulated courses at the college level (Bragg, 2000; Urquiola et al., 1997). Urquiola et al. (1997) concluded that this failure of secondary students to enroll in articulated courses suggested a lack of confidence that high school courses really can substitute for courses at the community college level. Hershey et al. (1998) estimated that only about 15% of tech prep students ever received articulated credit, postulating that it was because so few tech prep students attended community college at all, and that of those who did, many were required to take additional tests or undergo delays before being granted articulated credit. Bragg (2000) found that the consortia in her study were beginning to offer dual credits, rather than granting college credit after college enrollment (and sometimes, after completion of a semester). She concluded that this was a way of calling attention to the value of the articulation process.

Hershey et al. (1998) found that tech prep participation grew substantially in the 3 years between 1992 and 1995, but remained insignificant with respect to the total number of students in the middle range of school performance. Only 8.4% of high school students were reported by local consortia to be participating in tech prep initiatives. This number dropped to an estimated 1% of high school students if the authors counted only those students participating in the "strong" form of tech prep. Only 19% of tech prep high school graduates planned on attending community college articulated programs. This was due to the way that being a tech prep student was defined, the minimal emphasis placed on the articulation function of tech prep, and the failure of students to use the articulation agreements to their benefit.

Finally, Hershey et al. (1998) concluded that Federal funds should be spent on those consortia that are implementing the "strong" form of tech prep, so that the compounded benefits of all the components of the tech prep idea accrue to those students. Otherwise, tech prep funds would continue to be diluted in the vain hope that "all students" would want to have a comprehensive, career-based high school experience that leads to an articulated community college program. Or, alternatively, only some components would be offered to all students, which means that student experiences would not change significantly.

Curriculum integration. Perkins II called for the integration of vocational and academic education, but it did not define integration beyond a set of courses comprising coherent

sequences in which students can achieve both academic and vocational competencies. This left the details to states and localities. The integration concept was not unknown in the vocational community; its proponents go back a full century to John Dewey's exhortations to contextualize learning in U.S. high schools (1916). However, it took a more recent confluence of events to bring curriculum integration back in vogue.

First, many of the commission reports cited above were immediately championed by businesses. Many corporations felt that U.S. schools were not producing students who were prepared for the demands of modern work. They frequently needed more education and training, often remedial in nature.

The SCANS report (1991) supported the teaching of the required skills "in context." This support stemmed from a second factor in the ascendance of curriculum integration: research in cognitive science that suggested that students learned better when learning was modeled after "real world" learning outside of school (Brown et al., 1988; Lave, 1988; Resnick, 1987). For example, Resnick (1987) examined learning both in school and out, noting that schools lack the context for the adequate engagement of tools, other artifacts, and people. She noted that using calculators and conferring with friends are considered cheating, not learning methods. Resnick criticized conventional schooling as presenting theory almost exclusively, to the detriment of developing performance, or what Resnick called higher order cognitive abilities—how to think about the thinking and problem solving in which one is engaged. She reported that, conversely, effective out-of-school learning settings involved learners in socially shared intellectual work, such as group projects. Such contexts contained elements of apprenticeship, by which she meant that learners of all levels participated and developed their range and competence gradually. For schools to fulfill their societal mission, Resnick concluded, they must focus on those aspects of learning that occur in out-of-school learning situations, and include those aspects that could be replicated within the school curriculum.

Proponents of curriculum integration stated that it could serve several important purposes (Grubb, 1995a; Rosenstock, 1991). First, it could reform secondary education for at-risk students and others not in the academic track, making it more rigorous and inclusive of the kinds of competencies perceived to be lacking in traditional vocational (and general) tracks. When curriculum integration was coupled with new organizational structures (e.g., academies, see below), it formed part of what became known as the new vocationalism (Grubb, 1995a; Ramsey, 1995), which referred to a broadening of the goals of vocational education beyond job-specific training. But beyond this, curriculum integration could bring with it the opportunity to change the entire high school. Teachers could collaborate with peers outside of their discipline, and students would be provided with engaging academic courses that were related to broader themes of adult life or careers. Pedagogy, too, could change, as academic courses presenting students with applications of traditional bodies of knowledge, and vocational teachers incorporating rigorous methods and deeper understanding of various technologies. Indeed, formal and informal tracks themselves could become obsolete, as students oriented around career themes, regardless of their next step (i.e., postsecondary education or work).

Lofty goals are rarely realized quickly, and the 1994 National Assessment of Vocational Education (NAVE) found that integration was moving forward slowly. NAVE researchers found that teachers did not have enough time to work on curriculum integration, both academic and vocational teachers resisted the idea, and a larger framework within which integration could take

place was lacking (Boesel & McFarland, 1994). There were many ways to integrate academic and vocational curricula, some of which incorporated few, if any, innovative elements. For instance, where vocational teachers were simply incorporating more academics into their otherwise unchanged classes in an unchanged high school, or purchasing off-the-shelf curricular materials, teacher collaboration and engagement with integration was minimal (Grubb & Stasz, 1998). Other barriers to curriculum integration included both high school graduation and college admission requirements that often did not recognize or grant credit for integrated courses (Ramsey, Eden, Stasz, & Bodilly, 1995). The NAVE report noted that integration was furthest along in those states and districts that were undertaking other comprehensive education reforms that included the workforce preparation of all students. The NAVE report recommended the further emphasis of integration in vocational legislation.

Like many proposed changes to the structure of schooling, the initiative to integrate academic and vocational education has been supported with only anecdotal evidence of increased student engagement and achievement. To date, it has been difficult to assess the effectiveness of integration for all students, and thus for any subset of the high school population, such as at-risk students. In addition to the paucity of studies on the effects of curriculum integration (Stasz, Kaganoff, & Eden, 1998), "scaling up" this particular reform has proven challenging. Successfully scaling up reforms is difficult under any circumstances (Stringfield & Datnow, 1998). Given the relatively low status that vocational education has in high schools, and the fact that vocational and academic staff often interact little, much less collaborate (Hershey, Silverberg, & Haimson, 1999; Little, 1993, 1995), spreading reform based on curriculum integration has proven to be very slow. By 1997, a survey of comprehensive high schools (i.e., not including vocational high schools) reported that although the faculties of 90% of the high schools surveyed had attended professional development sessions on curriculum integration, only 45% had implemented such curricula (Levesque et al., 2000).

Work-related experience. Perkins II supported workforce preparation in the form of work-related experience, such as workplace learning opportunities that were coordinated and sequenced with learning at school. Like tech prep, work-related experience was not new, but the legislation encouraged such programs as a way of improving the transition from school to work.

One form of work-related learning is youth apprenticeship, defined as an experience "in which schools provide integrated academic and vocational education that is linked to employer-provided paid work experience and training at a work site" (Corson & Silverberg, 1994, cited in Urquiola et al., 1997). Another is cooperative education ("co-op"), the most prevalent form of school-supervised work experience in the U.S., with 8% of high school students participating (Stone & Mortimer, 1998). In co-op programs, students receive training in the context of a paid job. Students may also be involved in a school-based enterprise, an on-site work-related experience such as running the student store. Alternatively, they might be involved in off-site activities, such as building a house or producing other goods or services for sale. Students enroll in related classes (such as business management or construction), and often decide how to use the income generated by the enterprise, but are usually not paid. Students have reported that working in school enterprises provided more opportunities for doing a range of tasks and for working in teams than was the case in their outside jobs (Stern et al., 1995, cited in Urquiola et al., 1997). Students also reported having the space to make mistakes, whereas their outside jobs often did not have such opportunities. Combining school and work is usually beneficial in the lives of young people; most high school students want or need to work, and the effects on

students of part-time work of less than 20 hours per week can be positive (Stone & Mortimer, 1998; Warren, LePore, & Mare, 2000).

Kazis and Goldberger (1995) found that employers often complained of out-of-date teachers and technologies in high school vocational programs. By providing work-related experience themselves, employers often exposed students to state-of-the-art facilities and processes. Kazis and Goldberger (1995) reported employers' perceptions that worker qualities such as responsibility, teamwork, initiative, and problem solving were not adequately addressed in school-based programs. Only at the workplace could students learn about the demands of a real work environment. Benefits for students were clear: real work experiences, which students often found more engaging than school; and contact with adult role models, who could help young people build a network that would be helpful when they sought their first position after high school.

Pauly, Kopp, and Haimson (1994) described innovative programs linking school and work in 16 programs across the country, and offered many recommendations. They stressed the importance of extra student support, which was present in several ways at the schools they studied. Besides tutoring opportunities to help students keep up with the demanding curriculum, block scheduling and a school-within-a-school structure were found to promote a sense of community. As students worked with each other over longer periods of time and across several courses, they made friendships with their classmates. Those relationships supported learning and completing assignments (so as not to let down one's friends). Teachers also had the chance to know each student better. In some cases, teachers were required to telephone home if a student had been absent. This created for the students "a strong sense of adult involvement in their life at school, and close connections with a stable group of classmates who are seriously engaged in schoolwork" (p. 98)—all of which promoted staying in school and completing the program.

Another important finding was that programs that began before grade 11 were more likely to succeed in keeping young people engaged in high school. Many students begin to disengage from school in the middle school years. Schools that waited until the 11th grade to begin these programs found that many of the target students had already dropped out. Furthermore, schools found that their students were not qualified for substantive work-related experiences or internships in grade 11 or 12 if they had only had 1 year of preparation and introduction to the field. Beginning a program in grades 9 or 10 was found to better prepare students for their work-related experiences.

The Pauly et al. (1994) report concluded that the three main strategies needed to develop strong school-to-work programs and improve students' education were as follows:

1. change the nature and content of instruction to integrate academic and vocational education;

2. provide personalized student support for the increased academics and to foster a sense of belonging to a special community; and

3. provide work-based learning opportunities that show how curriculum content is used in the workplace (Pauly et al., 1994).

As with curriculum integration, scaling up work-based learning opportunities presents a challenge. Only a finite number of workplaces exist, and only a subset of those will be willing and able to work with schools to provide slots for students. Firms that have not formed partnerships with schools, and firms in which their sole experience with young people is through individuals responding to classified ads, often have negative attitudes about youth (Zemsky, 1994). However, many firms that provide structured work-based learning opportunities are pleased with the quality of the work done by young people (Lynn & Wills, 1994; Pauly et al., 1994; Steinberg, 1998). More recent studies of the outcomes of work-based learning will be discussed in the School to Work Opportunities Act section below.

Accountability. Before 1990, federal legislation authorizing vocational education expenditures at the secondary and postsecondary levels came with few reporting requirements beyond reporting program enrollment numbers and policy compliance (Hoachlander, 1995). However, Perkins II mandated that states develop performance measures, determine standards for those measures, and that local recipients of Perkins funds implement the evaluations (with some allowable modifications). Measures focused on student outcomes in 6 areas—enrollment, academic skills, occupational skills, school completion, job placement, and wages or job retention (Stecher, Farris, & Hamilton, 1998). These mandates followed along the lines of broader education reforms (i.e., Goals 2000), stipulating higher standards and more academic work with the goal of improving student outcomes. The NAVE report (Boesel & McFarland, 1994) found that states developed these performance measures, but that it took some time before schools began to implement them. Problems such as the lack of widely accepted assessment instruments made it difficult to assess learning outcomes across institutions, at both the secondary and postsecondary levels.

Perhaps the 1994 evaluations came too soon after the new Perkins mandates to definitively assess the elements that made Perkins II innovative. Since that time, the Perkins legislation has received reauthorization, now called the Carl D. Perkins Vocational and Technical Education Act of 1998, or Perkins III, which will be described below.

School to Work Opportunities Act

At nearly the same time as the report by Pauly et al. (1994), the School to Work Opportunities Act (STWOA) was passed. Its goals were to encourage states to develop and implement comprehensive statewide systems to help all young people prepare for high-skill, high-wage careers, utilizing workplaces as learning environments. These new systems would provide students with career awareness and exploration, work-based learning opportunities, and school-based activities to connect the learning at school to that at work, while ensuring strong academics.

An early evaluation of school-to-work (STW) programs found promising practices, but did not draw definitive conclusions (Stern, Finkelstein, Stone, Latting, & Dornsife, 1995). The authors noted one of the difficulties that has plagued all subsequent studies of STW—so many elements are involved in STW, when positive effects are found, it is difficult to know which element or set of elements has been responsible.

Urquiola et al. (1997) reviewed evaluations of several specific programs. They reported that the wide range of activities that fall under the umbrella term "school to work" made a generic evaluation of STW impossible. The authors concluded that their findings could not be

generalized to other programs. Some of the evaluations they reviewed found slightly negative outcomes for STW students, versus a comparable control group (Kopp, Goldberger, & Morales, 1994, cited in Urquiola et al. 1997); others found slight positive effects (Hollenbeck, 1996; Orr, 1998, cited in Urquiola et al. 1997). Some of the positive outcomes included lower school absence rates, higher college attendance rates, and longer and higher-paying employment. But some of the studies they cited had questionable control groups in terms of their similarity to the groups participating in the STW programs.

Urquiola et al. (1997) also identified the kinds of work-based learning opportunities that STW programs provide—paid work experience, unpaid internships, service learning, job shadowing, and school-based enterprises. Many of these opportunities are provided under the auspices of other reform efforts and are not necessarily called STW or funded with STW money. For this reason, research on programs incorporating STW elements will also be found in the sections below.

Hughes, Moore, and Bailey (1999) investigated the claim that work-based learning increases student motivation, and thus academic achievement. In the student internship programs they studied, they did not see much application or exploration of school-based knowledge such as reading, writing, or mathematics on the job. Rather than expecting internship sites to reinforce school-based knowledge, they suggested that programs could incorporate work-based situations into the classroom, and reinforce school-based knowledge through student internship experiences. Otherwise, student experiences at their internship sites were rarely used as the basis for structured academic activities or assignments at school (aside from common reflection activities such as journal writing). Although the authors did not find that work-based learning reinforced academic learning, they did find that it often increased student motivation. They found that students claimed to put more effort into their studies when they were linked to a career that interested them, which is certainly a worthwhile result, especially among students who are at risk of disengaging from school. This was not, however, as robust a finding as one might hope, given the costs associated with work-based learning.

In a national evaluation, Hershey et al. (1999) found that within the three major elements of the STWOA—work-based learning experiences, school-based learning experiences, and connecting activities—career exploration activities (e.g., individual career plans) were the most prevalent school-based learning activities. Brief worksite visits and job shadowing were found to be the most prevalent work-based learning activities. Over one-half of the high schools participating in STW partnerships and about two-thirds of seniors participated in such activities. However, only 3% of the students surveyed in 1998 were involved in activities that connected all three elements. Hershey et al. (1999) concluded that the minimal participation in fairly commonplace activities did not fulfill the promise of the STWOA.

This study also investigated the availability of STW activities to all students, as this was one of the goals of the legislation. The examination of the diversity of students involved in STW included the dimensions of academic performance, gender, and race. The authors found that in 1996, equal numbers of both "low achieving" and "academically talented" seniors participated in STW activities. They also found that although students who planned to attend college were somewhat more likely than others to take career-related academics, participation in such classes was growing among other students, doubling from 1996 to 1998.

With respect to gender, Hershey et al. (1999) found that females were the most involved in school-linked work activities. They posited that perhaps this was the case because females tended to be interested in the careers that commonly provide work-based learning experiences, such as health careers. Finally, with respect to race, the study found that career-related academies were growing in schools with large African American populations, so their participation in 1998 significantly exceeded that of Whites and Hispanics. The authors attributed this finding to the fact that career-focused magnet programs were often introduced in urban areas as part of desegregation efforts.

One important finding was that most students felt that their involvement in STW activities had helped them identify career goals (Hershey et al., 1999). Even among students who changed their goals, STW was helpful in making these decisions. Other studies support the finding that STW helps students define life goals. For instance, Hughes, Bailey, and Mechur (2001) found that STW students were more likely than other students to choose a major early in college, a sign of direction and purpose. These are especially encouraging findings with respect to at-risk youth. Rather than wander aimlessly through their high school years, in school or out, STW participants are exposed to life options, weigh them, and develop career goals. They have contact with adults outside the school setting in ways that foster further development, and they tend to follow through at the postsecondary level.

Hershey et al. (1999) concluded that STW broadened students' career options, rather than narrowing them, as many parents had feared. STW partnerships seemed to be focusing on career awareness, rather than forcing students into narrowly defined occupations. However, the study did not find that STW helped raise standards. Where standards were raised, it occurred independently, and sometimes even despite STW efforts. They concluded that although "modest progress has been made on the ambitious school to work agenda" (p. xv), it would be difficult for states and localities to continue to support STW activities after Federal funding ends.

More recent examinations of STW show that student participation in cooperative education or work experience coursework increased by 2% during the period from 1990 to 1994 (Levesque et al., 2000). Between 1997 and 1999, small but steady increases in student participation in STW activities continued, on the average of 1 to 2 percentage points each in job shadowing, mentoring, internships, co-op, and school-based enterprises/service learning (Medrich, Beltranena, & White, 2001). Youth apprenticeship numbers stayed the same throughout the period. In none of these activities did student participation exceed 12% of the responding local school-business partnerships (Medrich et al., 2001).

Despite the modest results of the above studies of STW implementation on a large scale, local adherents of STW note many benefits for students. They cite greater awareness of career options, improved attitude and motivation, better life and work skills, and a better understanding of the relationship between academics and careers (The Public Forum Institute, 2000). These anecdotal benefits have not been substantiated by empirical research. As previously noted, such data-gathering would be extremely difficult, given the many manifestations of STW across the country.

Perkins III

The 1998 Perkins reauthorization, known as Perkins III, addresses the role of secondary vocational education in the context of broader education reform. It supports the alignment of vocational education with state and local efforts to reform secondary schools, so that CTE becomes an integral part of these efforts. Lawmakers attempted to make the legislation more flexible and allow for more experimentation and program development. As an example, Perkins money may now be used in public charter schools that operate vocational programs. Also, the targeting in Perkins II of funding to special populations was eliminated, as it was seen to have contributed to the marginalization of vocational education.

Bailey and Kienzl (1999) state that Perkins III focuses funding on secondary and postsecondary programs that, among other things:

1. integrate academic and vocational education;
2. promote student attainment of challenging academic and vocational standards;
3. provide students with strong experience in, and understanding of, all aspects of an industry;
4. involve parents and employers;
5. provide strong connections between secondary and postsecondary education;
6. develop, improve, and expand the use of technology; and
7. provide professional development for teachers, counselors and administrators.

In terms of accountability, Perkins III set out four new core indicators of performance for Federally funded secondary and postsecondary vocational education programs. These include the following:

1. student attainment of challenging, state-established academic, vocational, and technical skill proficiencies;
2. student attainment of a secondary school diploma or its recognized equivalent, a proficiency credential in conjunction with a secondary school diploma, or a postsecondary degree or credential;
3. placement in, retention, and completion of postsecondary education or advanced training, or placement in military service, or placement and retention in employment; and
4. student participation in and completion of vocational and technical education programs that lead to nontraditional training and employment.

States and consortia that accept Perkins III money are required to identify indicators that measure performance on the four core indicators, and they are required to make progress toward improving the performance of vocational students in order to continue to receive funding.

Perkins III also reauthorized funding for tech prep programs, with some slight changes. The legislation took note of state academic standards put in place in the interim between Perkins II and Perkins III, and required that tech prep programs meet those standards. It also allowed funding to be used to link 4-year institutions with community colleges and high schools in tech prep sequences. Perkins III encouraged the use of work-based learning experiences in all aspects of an industry, which were components from the STWOA. Finally, Perkins III called attention to the need for professional development for teachers and counselors, in order that they might implement tech prep effectively, stay current with the needs of business, and provide this information to students.

There is a new National Assessment of Vocational Education (NAVE) underway, which is intended to indicate whether these innovations in the Perkins legislation have had any effect on academic or occupational outcomes of high school students in vocational programs. However, as with the previous NAVE, the timing of the assessment does not align well with the timing of new mandates, and many conclusions will necessarily be tentative. The NAVE report is due to Congress by July 2002. An implication of this tight timeline is that the last year for data collection, 2001, will only be able to examine the very early planning stages of states' and schools' change efforts (Grubb, 1999a). Nonetheless, because some of the requirements are continuations of Perkins II (e.g., tech prep, curriculum integration, all aspects of an industry), the new NAVE should provide useful information on program mandates, and some results of this study will move towards greater accountability. How much information the new NAVE will provide on the effects of vocational education on poor or minority students is unclear, because the funding priorities have shifted away from a focus on these and other special populations.

Finally, it is important to note that Perkins money is a very small percentage of any school or district budget. It should not come as a surprise if such modest funding were not able to effect fundamental change on a large scale—especially in helping students attain academic proficiencies. Perkins III cannot be expected to accomplish in isolation what education reform efforts have been trying to do for decades. This is a new mandate for vocational educators that will take time and many changes to achieve. For example, vocational teachers have taught skill areas, and many have not been trained to teach literacy. In addition, because of the small amount of money that Perkins funding provides, many schools use it to fund program development, not as a source for general educational reform. As common with Federal education money, the goals attached to Perkins III are laudable, but state and local decision making processes often pre-empt them with other important, locally-identified goals.

Given these realities, studies of the effects of Perkins III might most productively concentrate on how local schools are aligning their CTE with their more general reform efforts to help students attain both academic and vocational standards. Such studies might also address the efficacy of reformed CTE programs for at-risk students.

Non-Legislation-Driven Career and Technical Education Reforms

Along with reform efforts driven by Federal legislative mandates, there have been reform efforts of vocational education unconnected to any legislation. These include reform designs such as High Schools That Work, designed to provide college preparatory academics to vocational students, and reform strategies that reorganize the high school around new structures such as career academies, career magnets, and career pathways.

High Schools That Work

High Schools That Work (HSTW) began in 1987 as an initiative of the Southern Regional Education Board (SREB). It has since grown to include more than 1,100 schools in 26 states (Bottoms, 2001). Its goal is to "raise the academic achievement of career-bound high school students by combining the content of traditional college preparatory studies (e.g., English, mathematics, science) with vocational studies" (Herman et al., 1999, p. 76). This is accomplished through rigorous vocational courses, along with more required academic coursework. Common planning time is provided for teachers to collaborate on curriculum integration, and higher standards and expectations are set for all students (Bottoms & Presson, 1995; Bottoms & Mikos, 1995). Extra help is provided for students, as well as an individualized advising system. Finally, HSTW uses assessment information to improve student learning. All high school seniors who will complete a vocational or technical concentration at HSTW sites are required to participate in the HSTW Assessment, which is based on the National Assessment of Educational Progress (NAEP) tests of reading, mathematics, and science.

Research has shown that "HSTW students, including vocational students, take more academic courses than students at the same schools did" before HSTW was implemented (Herman et al., 1999, p.77). Schools that have implemented the design faithfully usually see improved student achievement and higher attendance, graduation, retention, and postsecondary attendance rates (Northwest Regional Educational Laboratory [NWREL], 1999). Studies also show improvement on the NAEP (Kaufman, Bradby, & Teitelbaum, 2000; NWREL, 1999); however, this data may be misrepresentative, since only those students who complete the HSTW-defined vocational concentrations take the tests, and lower-achieving, non-completing students do not take the tests at all. Such a sampling scheme is very likely to result in improved overall test scores, regardless of the program. In addition, some of these studies showing positive results were conducted by or for SREB, as opposed to being conducted by an external evaluator (Kaufman, Bradby, & Teitelbaum, 2000), and other studies have lacked a control group (Frome, 2001). Similar unfavorable observations on evaluations of reform efforts developed by organizations can also be made of evaluations of other school reform designs (Herman et al., 1999). Despite these limitations, HSTW remains an appealing design because it targets vocational students, who are often poor or minority, and students often at risk of dropping out of high school altogether.

Career Academies

Career academies have existed since the 1970s, but their focus shifted in the late 1980s from a dropout-prevention strategy to an approach that can prepare all students for both work and postsecondary education (Kemple & Snipes, 2000). In a longitudinal study on outcomes for students in career academies, Kemple and Snipes (2000) reported a 15-fold increase in the number of career academies during the decade of the 1990s, with many more planned. Most career academies incorporate the main elements of what is known as "the new vocationalism"—a broad career focus, a link to business, and curriculum integration (Ramsey, 1995). Kemple and Snipes (2000) noted the ways in which career academies differ from traditional vocational education, and reflect the new vocationalism, within a smaller learning community. They distinguish a career academy as an approach that 1) is organized as a school within a school, where students stay with a group of teachers over three or four years; 2) offers students both academic and vocational curriculum, usually integrated around a career theme; and 3) has established partnerships with businesses in order to build connections between school and work.

Although other studies of career academies have been conducted, the Manpower Demonstration Research Corporation's (MDRC) 10-year Career Academies Evaluation is the most comprehensive (Kemple, 1997; Kemple, Poglinco, & Snipes, 1999; Kemple & Snipes, 2000). Researchers at MDRC began the longitudinal evaluation in 1993, with the goal of providing educators and policy makers with information on the effectiveness of career academies on student engagement in and completion of high school, and on student transitions after high school. Because each of the career academies in the study received more student applications than they could serve, and students were chosen to attend at random, MDRC was able to construct a random assignment study design that would more confidently attribute differences between the groups to the "treatment" of a career academy experience.

Part of the purported benefit of career academies is the smaller, more personalized learning environment it creates, when compared to the comprehensive high school. Kemple (1997) found that the smaller learning communities created by career academies resulted in increased teacher support of students, which enhanced student motivation. Teachers also benefited, because they were given opportunities to collaborate with peers and to develop their craft. Kemple (1997) found higher job satisfaction among career academy teachers.

In terms of student outcomes, Kemple and Snipes (2000) found that among students at high risk of dropping out, those in career academies dropped out 10% less than non-academy students in the study. Their attendance rates were 6% higher, and 40% of the academy students earned enough credits to meet graduation requirements, compared with 26% of the high-risk non-academy students. Even among students at low risk of dropping out, career academies increased their likelihood of graduating on schedule, and increased their vocational course taking without reducing their completion of the academic core curriculum. The MDRC researchers found that career academies did not improve student standardized test scores; however, they questioned whether such scores are the best measures of the kinds of learning that takes place in career academies. Kemple and Snipes (2000) found a great deal of variation in these findings across the nine academies in the study, making it important to examine disaggregated results in order to identify which types of career academies were most effective for which subgroups of students. Specifically, those career academies that provided strong interpersonal supports to students in the

early years of high school appeared to be most successful in achieving the positive outcomes described above. The interpersonal supports identified by the study were as follows:

1. a core group of four or five teachers who teach almost exclusively within the academy;

2. students who are scheduled together for several courses, to the exclusion of non-academy students; and

3. housing the academy in a distinct area of the school building.

These tight-knit, school-within-a-school features appeared to have nurtured "a more personalizing learning environment and helped students and teachers feel that they were part of something unique within the school" (p. ES-19).

The authors recommended that career academies should continue to serve a heterogeneous population of students, because it could be the mix of engaged and at-risk students that helped bring about the benefits for the latter group. They also stressed the importance of the interpersonal and academic supports provided by career academies, claiming that simply offering a career focus and work-based learning without such supports would not be sufficient to engage at-risk students.

Another recent study of career academies in one inner city district in California with a large minority and low-income population found that academy students were generally more successful than the non-academy students at the local 4-year university (Maxwell, 1999). Academy students were found to have higher GPAs, to need less remediation in English in the university, and to graduate from the university more often than their non-academy peers. Despite these strong comparative findings, over 40% of the academy students still needed some remediation, and less than 60% graduated from the university. Maxwell concluded that although academies contributed to educational success for a group of students not likely to attend college, this influence was not enough to overcome all the disadvantages faced by at-risk students from inner-city high schools.

Career Magnets

The findings from the career academies evaluation were mirrored in a study of career magnet schools conducted by Crain and his colleagues (Crain et al., 1999; Crain, Heebner, & Si, 1992). Career magnets include college preparation along with career preparation, and they are not necessarily vocational schools—some magnets are free-standing, while others are housed within a comprehensive high school. One difference between a career academy and a career magnet is size. Academies refer to small learning communities, usually housed within a larger school. Even if a whole school is broken up into academies, each one is relatively small in size. Career magnets may be housed within a larger school, but a career magnet can also be an entire high school devoted to one particular career focus. In such a case, there is no "small learning community." Another difference between academies and magnets is their origins. Career academies began as a dropout prevention strategy, while career magnets often trace their roots to desegregation efforts, in which urban districts created magnet schools that might otherwise be racially segregated.

Crain et al. (1992) conducted a longitudinal study on the effectiveness of career magnets in New York City. As in the Kemple & Snipes study above (2000), Crain et al. were able to construct an experimental design due to that city's random assignment of students to magnet high schools. Schools were permitted to select one-half of their students; however, even that half had to include students from all reading levels. Early analyses examined the effect of career magnets on lower-achieving and average-achieving ninth-grade students, finding differences between career magnets located in comprehensive high schools and those that were free-standing (Crain et al., 1992). They found that students of average reading ability who attended free-standing magnets earned more course credits than demographically similar students in regular comprehensive high schools. Magnet students increased their reading skills more than twice as much as comparable students in comprehensive high schools.

Low-scoring readers assigned to free-standing career magnets were more likely to attend high school, and more likely to pass the state Regents math test than similar students in regular comprehensive high schools. However, these same students did not increase their reading test scores, and they were found to be absent more frequently than their regular high school counterparts, regardless of the type of career magnet they attended. In general, though, the authors claimed that "magnet programs which isolate themselves from the rest of their school have more success educating their average readers" (1992, p. 37). In addition, those magnets that provided students with a greater career focus, such as special equipment or placement services, were most effective with poor readers. The authors posited that attending a school with a special and separate career focus often meant the difference between a student's attending high school and dropping out.

These early reports attributed impressive results for career magnets. However, the authors noted two caveats. First, career magnets had to deal with weaker students within the confines of their budget, which was equal to that of comprehensive high schools, yet had to be applied toward the school's career focus. Many career magnet teachers felt that addressing the needs of the weaker students diverted resources from that focus. Second, because the magnets in New York City could select one-half of their populations, and because they also attracted some of the higher-achieving students, the authors wondered whether education for students in the city's comprehensive high schools had been weakened.

In later analyses of these schools, Thaler and Crain (1996, cited in Urquiola et al., 1997) found that career magnet student test scores, absenteeism, and Regents exam-taking rates were actually quite similar to those of students from traditional comprehensive high schools. After examining the records of over 9,000 students who applied to 50 career magnet programs, they concluded that student outcome results were not higher at career magnets and, in fact, many career magnet programs had lower graduation rates and higher dropout rates than comprehensive high schools. They attributed this to the ability of career magnets to push weaker students out of the most desirable classes and internships. This left such students with an even lower chance of graduating than if they had attended a comprehensive high school. In fact, many career magnet programs ranked their sophomores, keeping only one classroom's worth of the best students for the junior and senior year's advanced classes and internship opportunities. The rest became regular comprehensive high school students, or remained in the magnet program in name only.

Crain et al. (1999) also conducted interviews with career magnet students and the students who had applied but were not chosen. They found that career magnet graduates were less likely to engage in risk-taking behaviors, and they were more likely to earn college credits after graduation than were graduates of comprehensive high schools. They also noted the importance of friendships established at the career magnets. Students made friends with others who were also interested in a particular career. Such friendships fostered career-related conversations—planning and projecting—in ways that may not have been likely or acceptable in other, more traditional, high-school settings.

This longitudinal study concluded that the success of career magnets rested on the magnets' ability to create a school culture that promotes hard work and a common commitment to a particular career area (Crain et al., 1999). Career magnets do not depend on large budgets, or complete overhauls of curriculum and instruction. Much of the benefit comes from a school's ability to help adolescents through the important process of identity development by providing a network of sustained, caring relationships that communicate to students that they have real chances to succeed in a particular career.

Career Pathways

Some high schools have been reorganized into career pathways, replacing traditional tracks such as college prep, vocational, and general tracks.[5] A career pathway is a cluster of occupations that share similar interests and strengths, although they may differ in terms of length of education and training required. For example, a cluster such as engineering, manufacturing, and industrial technology can provide students with a broad introduction to many fields, such as machinist or engineer. Career pathways form the context for integrated activities such as senior projects and other interdisciplinary activities. Pathways, like many other reforms with roots in vocational education, are intended to have strong connections with business and industry and with postsecondary education, in order to give students internships or other applied experiences. Pathways are also intended to provide a rigorous, coherent program of study that includes high-level academics, in addition to technology applications and work-based learning. The U.S. Department of Education (2001a) has identified 16 career clusters that high schools can choose from in developing their pathways, depending on local labor market opportunities.

The evidence from these high school organizational structures seems to indicate that career academies, magnets, and pathways are possibly productive ways for secondary vocational education to position itself for the future. There is a research base showing positive outcomes, especially in terms of career preparation and postsecondary attendance. The elements of these structures are pedagogically and theoretically sound, and, in the case of magnets and academies, have proven effective in the best of cases. One possible reason is that they are strategies for all students, not low-status programs for those not deemed "college material." Students are very aware of their position in the high school hierarchy, and the stigma of vocational education may have grown strong enough in some schools to preclude it from being successful in its traditional forms. Another reason is that career academies, magnets, and pathways restructure the school. In the best of cases, students feel that their teachers care, their peers care, and they all share a common interest and goal. These affective factors are likely to increase students' engagement

[5] Pathways are now mandated in some districts and at least one state (Washington). Washington State provides one of very few examples of a specific high school reform strategy being mandated statewide.

and are likely to improve achievement as well. Such reforms may also affect students' perception of their life chances.

How much of the improvement in student outcomes is attributable to caring relationships and how much is attributable to CTE-related reforms? This is a difficult question to answer, because the two confounded elements are bound together in the best examples of these schools. The students are not the only ones involved in positive relationships; teachers, too, have developed professional communities around certain themes (in these cases, career-related themes), and have become responsible to each other. Perhaps non-career-related magnets experience the same results. However, it is useful to note that in reports to Crain et al. (1999), students claimed that their high school experience was useful in developing a career identity and in becoming proficient at something. Non-career-related high school reorganization along the lines of academies or magnets would be unlikely to produce this result (Ready, Lee, & LoGerfo, 2000).

Summary of Career and Technical Education Reform Strategies

Efforts to improve secondary vocational education have broadened beyond the historical role of job-specific preparation. The elements that are now included in vocational programs include the following: a broader focus on all aspects of an industry rather than job-specific training; attention to student achievement through some form of academic and vocational curriculum integration; strong connections to workplaces while students are still in high school; learning activities that link experiences at those workplaces with school learning; smaller learning communities with a career focus to help engage students and keep them in school until graduation; and connections to postsecondary institutions to encourage further education.

All of these elements have expanded the traditional role of vocational education, to provide not only education for and about work, but also education through work. In fact, education for work has been downplayed at the high school level in order to use the workplace at large as a learning site. The research has not yet shown that education through work has fulfilled its promise, and there are hurdles to overcome in terms of realistic outcomes for the resources provided; but within limited funding, the concept is being explored in increasing numbers of schools.

Perhaps most importantly, a few studies have found positive effects for some of the more at-risk populations in urban areas (Crain et al., 1999; Kemple & Snipes, 2000; Maxwell, 1999). Such findings need to be replicated and expanded, but they give hope that there are opportunities for poor and minority youth within an expanded conceptualization of career and technical education. Given the new accountability requirements in Perkins III, it is important to seek more definitive answers as to the efficacy of the new vocationalism.

Comprehensive School Reform

The history of U.S. education has been one of nearly continuous efforts at educational reform (Tyack, 1974). The 20th century was a time of well-documented efforts at educational improvement. However, careful historical scholarship (Cuban, 1993), and the best available quantitative data on student achievement (Campbell et al., 2001) leave the disquieting impression

that a great deal more has been tried than has succeeded.[6] Cuban (1993) and Sarason (1990) have clearly documented that although changes in such areas as access to schooling and bureaucratization have changed in the last 100 years, widespread change in fundamental educational practices related to teaching and learning are very rare.

School reform efforts differ along three fundamental dimensions. The first concerns the scope of reform. Are the would-be educational improvers simply trying to improve either the curriculum or delivery system in a targeted area (e.g., French, computer skills), or are they attempting to change aspects of the entire school? Forty years of research in diverse educational areas (Nunnery, 1998; Stringfield et al., 1997) have demonstrated that, generally speaking, reforms are much more likely to have long-term impacts on school culture and student achievement if the change effort involves a school-wide focus rather than a targeted focus. Therefore, this section will focus on "whole-school" or "comprehensive" school reform efforts.

A second basic reform dimension relates to the origin of the reform design. Is the proposed change the result of a group of local educators inventing their own reform, or is it an adoption/adaptation of a design being disseminated at the state or (increasingly) national level? The local types of reforms tend to fall into informal "types," such as "block scheduling," or "sustained silent reading," or "writing across the curriculum." The externally developed designs tend to be more specific concerning group processes (e.g., Accelerated Schools; Hopfenberg & Levin, 1993), components (e.g., High Schools That Work; Bottoms & Presson, 1995), cross-disciplinary curricula (e.g., Core Knowledge; Hirsch, 1995; Datnow, Borman, & Stringfield, 2000), or a combination of the above (e.g., Talent Development Middle and High Schools; MacIver, Plank, & Balfanz, 1997; McPartland, Legters, Jordan, & McDill, 1996). Most also propose an implicit or explicit shared belief system (e.g., Coalition of Essential Schools; Sizer, 1984, 1992).

After reviewing the five largest U.S. school change studies of the 20th century,[7] Nunnery (1998) concluded, among other findings, that, "local development can be successful but is riskier and costlier than implementation of externally developed models" (p. 284). A consistent finding of the studies was that locally developed reform efforts tended to begin with a flurry of committees and design work, but moved to actual classroom implementation in only a minority of instances.

A third basic dimension of school reform efforts is specificity. Some reforms, such as the Talent Development Middle and High School designs, have specific curricula in the areas of basic reading and mathematics skills, and career education (Balfanz & MacIver, 2000; Jordan, McPartland, Legters, & Balfanz, 2000). In contrast, the Coalition of Essential Schools and the Yale School Development Program (sometimes called the Comer design after the emeritus founder, Dr. James Comer; Haynes, 1998) are deliberately silent on the specifics of curriculum

[6] This is not to suggest that there have been no successes. For example, Title I, the Federal investment in compensatory education, appears to have an enduringly positive effect, though it is chiefly observable in primary grades (Borman, Stringfield, & Slavin, 2001).

[7] The Eight-Year Study of the 1930s (Aiken, 1942), the Follow Through Classroom Observation Evaluation (Stallings & Kaskowitz, 1974), Federal Programs Supporting Educational Change, or "The RAND Change Agent Study" (Berman & McLaughlin, 1978), Dissemination Efforts Supporting School Improvement, or DESSI (Crandall et al., 1982), and the Special Strategies Studies for Educating Disadvantaged Children (Stringfield et al., 1997).

and instruction. Along this dimension, Nunnery (1998) concluded that "reform strategies focusing exclusively on changing organizational cultures and structures as a prerequisite for reform have not proven successful" (p. 288). It should, therefore, come as no surprise that the majority of studies of, for example, the Coalition of Essential Schools, with its focus on cultural and organizational issues, have found no measurable student outcome effects (for review, see Herman et al., 1999).

Spurred in part by increasing Federal funding for Comprehensive School Reform Demonstrations (2002 funding is $260 million), more schools are adopting comprehensive school reform designs each year. The difference between this and previous reform waves is the institutionalization of certain designs and the emergence of universities, companies, or foundations that develop, market, and deliver these designs to schools across the country. Schools adopt these designs more or less completely, although they will necessarily look different in each school because of the schools' various contexts and histories, and the different belief systems of the people implementing the reform (Datnow & Castellano, 2001; McLaughlin, 1987). The school change process inevitably involves a certain amount of co-construction, in which schools adapt the designs somewhat to fit their context and mission (Datnow, Hubbard, & Mehan, 1998; Datnow & Stringfield, 2000), but schools that modify a design excessively are considered poor implementers by the parent organizations, and extreme adaptations can cause a school to lose their affiliation. Furthermore, a variety of studies over more than half a century have noted a positive correlation between the level of reform design implementation and the improvement of student outcomes (Aiken, 1942; Stallings & Kaskowitz, 1974; Stringfield et al., 1997). Below we review some of the more enduring or well-known comprehensive school reform designs, and the practices they advocate. This review is intended to be illustrative, not exhaustive, of the range of options.[8]

Talent Development High Schools with Career Academies

The goal of Talent Development High Schools with Career Academies (TDHS) is to "improve achievement and other outcomes (e.g., attendance, dropout rates) for all students in large high schools by creating a personalized environment that focuses on students' interests within an academic core of courses" (Herman et al., 1999, p. 121). In TDHS, a high school is reorganized into a Ninth Grade Success Academy and career-theme-based academies for sophomores, juniors, and seniors. Each academy includes its own faculty, management team, and section of the high school facilities. The faculty of the Ninth Grade Success Academy is further divided up into interdisciplinary teams so as to create smaller learning communities, which, as described above, can increase student engagement in school.

TDHS provides a common planning time for teacher teams to meet. The Ninth Grade Success Academy and the career academies provide college preparatory level academics, and the career academies provide career experiences within a chosen career theme. Academic faculty develops curriculum for electives within each theme, although the TDHS developers also provide some curriculum packages. TDHS offers an after-hours Twilight School for students with attendance, discipline, or other problems. Research on the initial TDHS found increased student attendance compared to previous years at the study site high school (McPartland et al., 1996). Research at subsequent sites found improvement in student performance on standardized tests as well (Balfanz & Jordan, in press; McPartland, Balfanz, Jordan, & Legters, 1998;

[8] The choice of reforms described in this report is not an endorsement of any or all of the designs.

Philadelphia Education Fund, 2000). As with many other reform designs, independent research is currently underway to substantiate the results that TDHS appears to produce in schools with high at-risk populations.

There is also a Talent Development Middle School (TDMS) reform design (Balfanz & MacIver, 2000), which includes research-recommended, standards-based forms of instruction, ongoing professional development for teachers, and strong student learning supports. Career awareness and exploration curricula are provided for all three middle school grades. Research on TDMS suggests that it has improved student learning and academic achievement (Balfanz & MacIver, 2000; MacIver et al., 1997). An independent evaluation of whole school reform in one city's middle schools found evidence of positive effects of TDMS implementation, such as more consistently high quality instruction and engaging pedagogy, according to students (Corbett & Wilson, 1999).

Coalition of Essential Schools

The Coalition of Essential Schools began in 1984. It is a network of K-12 schools that share a set of guiding principles known as the Ten Common Principles, around which schools base their reform efforts (Sizer, 1984, 1992). The first principle states that the school's focus should be to help students use their minds well. Other principles stress the teacher's role as coach and the student's role as worker, and a focus on a few essential skills and subjects rather than superficial coverage of many. Schools use these principles to redesign themselves into the kind of climate that promotes improved student learning, decency, and trust. There are no curriculum or instructional techniques imposed on schools by the Coalition; each school interprets the principles for its own context. However, block schedules and team teaching (with common planning times) are encouraged as ways of promoting deeper learning and creating a sense of community in the school.

Studies have shown that schools that hope to join the Coalition often find that their vocational staff feels threatened, since subjects outside the core academic classes are often eliminated as "non-essential" in CES schools, in favor of a more intensive focus on academics (see Muncey & McQuillan, 1996; Stringfield et al., 1997). In addition, Coalition schools have not shown improvement on achievement test scores (Stringfield et al., 1997; see Herman et al., 1999 for a review of multiple studies), although internal research shows that the top-implementing CES schools outperform the national average on standardized test scores and college entrance exams (SAT) (Coalition of Essential Schools, 2000). Researchers have noted difficulties in implementing this reform design, especially if all teachers are not on board, or if the school attempts to implement the Common Principles in only one area of the school, such as a school-within-a-school (Muncey & McQuillan, 1996).

Urban Learning Centers

Urban Learning Centers (ULC) is a K–12-wide reform design that creates articulated communities across all grade levels, usually housed in one building. A description of the initial design, called Los Angeles Learning Centers, was written by Johnson and McDonald (1996). This approach to school reform has 3 components:

1. teaching and learning, including integrating high standards into a thematic, interdisciplinary curriculum, experiential learning, and multi-age classrooms;

2. governance and management, meaning that all staff and school stakeholders are empowered to collaborate in the decision-making process; and

3. learning supports, such as health services, social services, and parent education on site.

Fully 98% of the first graduating class of the first two ULCs were accepted to postsecondary institutions—a tremendous increase over these schools' previous numbers (Aschbacher & Rector, 1995). This suggests that the design can have an effect on student outcomes in troubled urban areas; however, more rigorous studies remain to be conducted.

New American Schools Designs

Former President George Bush helped create a group of non-government-supported designs for improving schools. They were privately funded through the New American Schools Development Corporation (Kearns & Anderson, 1996; Datnow & Stringfield, 1997). New American Schools (NAS) designs that contained a secondary school component include the Audrey Cohen College, ATLAS, Co-NECT, Expeditionary Learning/Outward Bound, The Modern Red Schoolhouse, the National Alliance for Restructuring Education (now "America's Choice"), Community Learning Centers, and the above-described Urban Learning Centers (formerly the LA Learning Centers). Each of these is described in detail by its developers in Stringfield, Ross, and Smith (1996). All involve more active learning activities for students, more "authentic" assessments, and varying degrees of restructuring of the school day and year.

Unlike the vocational reforms described earlier in this paper, comprehensive school reform designs are designed to be adopted in their totality. Even the legislation-driven vocational reforms are not as strict in their adherence to specific elements as are the comprehensive designs. This may be because the whole school reform designs depend on strict implementation of specific elements for their outcomes. Should a school not implement faithfully, the promised outcomes may not take place. It is in the design teams' interest to ensure faithful implementation, so as to ensure positive outcomes. Conversely, schools adopting vocational reforms have more leeway, but that openness has often led to schools either "re-inventing the wheel" or simply "spinning their wheels" without making significant gains in student outcomes.

Despite the progress, more independent studies are needed on comprehensive school reform designs to discern their effects on students, high schools, and the CTE programs offered in them, especially in schools serving at-risk student populations. Educators and policymakers need to better understand what factors contribute to student success, especially in poor urban schools.

Other Strategies and Reform Efforts

There are other reform initiatives that did not arise from either the vocational or comprehensive reforms described above, but rather come from other sources. Some of these initiatives were developed for at-risk students. Of interest here are those that included career preparation as an element in their approach to engage at-risk students in school, and to prepare them for adult life. Two approaches are reviewed below.

Middle College High Schools

Middle college high schools were developed over 20 years ago in New York City as a way to engage high-ability but low-performing high school students, often from high-poverty or minority communities. A middle college high school is located on a community college campus, offers a college preparatory curriculum, and coordinates the transition from high school to college (Lawton, 1996). Many middle college high schools also offer school-to-work experiences and internships, and expose students to postsecondary education. The goal is to keep at-risk students in school and to help them see the linkages between what they learn in school and their future lives. Middle college students can take college-level courses while still in high school, often with the tuition waived, which is a significant benefit for low-income students (Stone & Adams, 1999).

In a study of one middle college high school, 87% of the students completed their graduation requirements. Nine out of 10 of these students enrolled in the community college after high school, and most of them transferred to a 4-year institution after that (Lawton, 1996). Proponents of this approach tout the benefits to both high schools and community colleges—the high school is able to (a) provide unparalleled coursework and opportunities to students, and the college is able to recruit from this pool, and to (b) ensure that this portion of its potential incoming class is prepared for college-level work. More research is needed as the middle college high school model spreads throughout the country.

New American High Schools

New American High Schools (NAHS) are high schools identified by the U.S. Department of Education (USDOE) as innovative sites of school improvement (Visher, Emanuel, & Teitelbaum, 1999). By 2000, 59 urban, suburban, and rural high schools had been identified as NAHS, employing combinations of comprehensive school reform and vocational education reform strategies (USDOE, 2001b). Most NAHS have implemented higher standards and expectations, broken up large high schools into smaller learning environments, and reorganized their schedules to include longer blocks of class time—strategies described above as ways of improving student achievement and school morale. The NAHS have also paid attention to the need to prepare students for careers, incorporating some of the strategies from vocational education reform efforts, including linking classroom- and work-based learning, encouraging career awareness and preparation, structuring learning around careers, and forging partnerships with businesses and postsecondary institutions (Visher & Hudis, 1999). The NAHS adopt any number of these strategies, according to their own particular needs and mission.

Most NAHS include attention to several other reform strategies not yet described. These include support for professional development that helps teachers acquire new teaching methods, develop integrated curricula, and use technology in the classroom. Such professional development is often delivered by other teachers and encourages active learning within a community of peers

(Visher et al., 1999). In addition, some NAHS are experimenting with alternative forms of assessment that do not depend on students passively acquiring and reporting on information, as in multiple choice tests. Authentic assessment techniques, such as senior projects and portfolios, provide a more active means of demonstrating what students have learned, and allow for peers and community members to become involved in judging student mastery of knowledge and how it is used outside of school. Senior projects usually involve library research, community research realized in the form of a project, and an oral presentation. Portfolios are collections of student work and other records that demonstrate a student's knowledge and competencies (Visher & Hudis, 1999).

These strategies aim to retain at-risk students, improve their engagement and achievement, and prepare them for postsecondary education. In addition, they advance teacher expertise. Unfortunately, the research base for the effectiveness of these methods is still weak, requiring further studies. Since the various strategies involved are rarely implemented alone, isolating the effects of any one of them would be difficult (Visher et al., 1999). However, the NAHS experience suggests that it is the synergy created by combining these strategies that has allowed these schools to see some measure of success (USDOE, 2001b; Visher et al., 1999). As with so many of the initiatives and reform efforts described here, evidence of the success of NAHS as a whole has been anecdotal to date, but studies on outcomes for NAHS and their students are currently underway (USDOE, 2001c).

Integrating Comprehensive School Reform with Career and Technical Education

The separation of vocational and academic education seems a natural product of the historically different goals and funding mechanisms of the two areas of high school curricula and their subsequent different trajectories. Even as the most recent reform movements swept across U.S. high schools, the two sides of the school and the people in them often continued to work separately. However, there are efforts to integrate these sides into a unified approach that improves prospects for young people and working conditions for adults in the high school at the same time. In this final section on secondary school reforms, we review studies of some of the attempts schools have made to integrate comprehensive school reform with career and technical education. The studies are few and inconclusive, but they point the field in a promising direction.

There have been attempts to include CTE while "restructuring" schools (e.g., Little, Erbstein, & Walker, 1996; Prestine, 1998; Wermuth, Maddy-Bernstein, & Grayson, 1997). Integrating vocational reforms with broader education reforms is part of what is meant by the "new vocationalism" (Ramsey, 1995) and what some mean by "comprehensive" school reform. Research on these attempts has shown that "restructuring" has usually referred only to governance issues or to breaking up the comprehensive high school into academies or houses. Although career academies can yield some positive results for at-risk students, these typically do not include improvements in standardized math and reading achievement test scores (Kemple & Snipes, 2000).

Wermuth et al. (1997) described four urban schools that were undergoing restructuring that included vocational education as a key component of their efforts. Unfortunately, none of the sites in the Wermuth study were beyond initial implementation phases. Two sites had only implemented block schedules, another was working on an initiative that had come from the vocational staff, and the fourth had not progressed much in its reform efforts. Thus, the few

changes that had taken place were at the organizational level, rather than at the level of student learning. Three of the four schools had not solidified any relationship with business or industry, a crucial component of any career-based reform so as to provide opportunities for students. The study described how restructuring schools need extra time to plan changes and develop the teamwork to implement these changes. They also concluded that restructuring is an ongoing process, pointing to the need for studies of schools that are further along in their reform efforts.

Another study that looked at the interplay between vocational and academic reforms did indeed focus on high schools that had been implementing their academic reforms for at least five years (Prestine, 1998). This study was an organizational analysis of two schools that were members of the Coalition of Essential Schools, and they had begun to be involved in tech prep initiatives. In one school, whole school change was centered on the Coalition supporters, partially due to the earlier start by the Coalition supporters. The career and technical education group had to fit their agenda into the ongoing reforms. The second school was a successful high school that did not perceive itself as "needing" reforms, and consequently, both the Coalition and the vocational reforms were marginalized. Neither effort had a chance of becoming a vehicle for reflection on goals or for change at this school.

Because this was an organizational analysis, Prestine (1998) did not examine student achievement. Additionally, the student populations at both high schools were overwhelmingly middle to upper-middle class, White, native English speakers. Thus we still need more research on the blending of academic and vocational reform in diverse communities. One important result of the Prestine study was to expose the difficulties of making reforms work when they originate on the vocational side of the building. Academic subjects continue to reign over vocational ones because they are the barometer of student and school success. Prestine (1998) concluded that vocationally based reforms are not likely to fare well, coming as they do from a marginalized part of the high school, and this will be especially true if they call for the active involvement of academic teachers. This latter group must see clear relevance and benefits to them or they will not participate. Prestine (1998) recommended, as did Wermuth et al. (1997), that vocationally based reforms link with other reforms to help ensure their success.

Little et al. (1996) investigated the question of the "fit" between high school restructuring and vocational reform. The authors conducted case studies of two schools involved in such a combination of reforms. One high school was a member of the Coalition of Essential Schools; the other was a new high school that attempted to restructure itself into various types of small learning communities to encourage collaboration among teachers and a sense of identity and belonging among students. Both began career academies, although in neither case were they the only option for students. In one school more than the other, the goals of vocational education became more integrated with those of the schoolwide change agenda, but in neither school was there a consensus among teachers that career preparation was a proper goal for the high school to pursue. As is common in these types of efforts, the image of vocational education improved somewhat, but academic teachers were still reluctant to "sully" their disciplines by incorporating vocational themes into their classes. Because the academies were just one element of overall reform and not integrated into the entire school's agenda, there was no forum for teachers outside the academy to debate what it meant to prepare students for productive work life, and how they should incorporate that mission into their classes.

Summary of Educational Reform in Secondary Schools

Despite the recognition on the part of vocational educators that career exploration and preparation is more important than ever, other stakeholders and decision makers in the high school have often gone in different directions. Vocational reforms have typically remained as marginal as vocational education in many high schools. The amount of Federal and state funding for career and technical education has remained constant over the last two decades, meaning that it has declined as a percentage of the Federal USDOE budget—from about 6% to 2.5% (Goodwin, 2000). Vocational education is at a crossroads—it could become an anachronism in our time, or it could become a part of larger, comprehensive school reform efforts.

The vocational program is certainly not the only one needing reform and rethinking. Graduates of the college preparatory track often have to take remedial courses at the college level, and they often lack direction in their choice of a major in college (Stasz et al., 1998). The linkage of vocational and academic reforms would join the expertise of vocational educators in career preparation and applied learning with more traditionally academic concerns, making the academic curriculum more relevant and engaging, and making the vocational curriculum more appealing. By lessening the division in the curriculum and in the geographical structure of the high school, the status distinction between "career-bound" and "college-bound" students is often diminished. Another way to decrease the distinction is for states to incorporate the methods of CTE accountability into their state's accountability systems for schools, so that all students have to attain competency in both academic and work-related areas.

Given the findings reviewed above, we believe that linking vocational and academic reforms is not only desirable, but necessary. Together, these efforts can address the need that all students have for a solid academic education as well as for preparation for adult life, including work. Successful attempts to make this reform linkage need to consider the following components, which can be grouped into structural reform, capacity for reform, and pedagogical reform.

Structural reform includes such initiatives as:

1. career academies or similar learning structures of smaller communities that focus on broad career clusters;
2. block schedules or other alternative schedules for longer learning times;
3. vertical integration of curriculum spanning the middle schools, high schools, and 2-year colleges; and
4. partnerships with business and other community sectors.

Support for the capacity for reform includes such efforts as:

1. interdisciplinary teacher teams with common planning time provided;
2. ongoing professional development; and
3. new emphasis on work-based learning, from job shadowing to more intensive forms.

Support for pedagogical reform includes such activities as:

1. high standards and expectations for all students, with learning supports to help students meet the standards;
2. authentic assessment;
3. interdisciplinary curriculum that integrates rigorous academics and real-world applications;
4. project-based learning; and
5. technology integrated into classroom learning and used by teachers to monitor student progress.

In addition, there is a general consensus that career exploration and guidance should begin early, probably in the middle school, so as to engage young students at risk of dropping out, and in order to provide enough knowledge and experience for them to be able to participate in authentic work-based learning experiences in workplaces in their junior or senior year of high school.

A final component of successful secondary school reform is district-level, or more broadly, systemic-level support for creating and sustaining reform. Stringfield (1995, 2000) and Datnow and Stringfield (2000) have explored the supports necessary for schools to successfully implement and sustain virtually any of the reforms discussed above. The two authors conclude that a shared focus on reliable reform is necessary. This can be referred to as reliable co-construction. Summarizing 16 studies of school change efforts, Datnow and Stringfield (2000) describe eight necessary characteristics for reliably sustainable reform:

1. A finite set of widely shared goals.
2. Goals must be tied to a long-term, whole-team focus on key measures of school improvement.
3. Districts must develop a coordinated and broad-based plan for disseminating information about reform options, prior to the school- or district-level commitment to reform.
4. Schools must engage in a thoughtful, critical process of inquiry about what needs to change and why.
5. Reform designs (and reform designers) must do the following:
   a. view local context and the diversity of language, race, class, and gender of those involved as strengths to build on;
   b. see teachers as assets and collaborators, not simply implementers of reform;
   c. address technical, normative, and political dimensions of change;

d. affect the whole school, not just a safe "pocket" of people who are particularly eager to change; and
e. include equity as an explicit goal of reform.

6. The district, school, and any external partners must provide multidimensional, ongoing support and leadership for the reform.

7. Policy systems need to be aligned in order to support the reform effort.

8. Successful implementation requires sensitivity and adaptability (without academic compromise) on the parts of all key players. States, districts, and design teams must be willing to change along with the schools and teachers. Such active, shared growth is at the heart of both co-construction and high reliability.

The most important point to be drawn from the systemic supports literature is that reliably creating and sustaining reform is a complex, but knowable and achievable, task.

Much more remains to be learned about how high schools engage in reforms, and about how to successfully integrate career and technical education into those reforms. Most importantly, we need to learn more about how that integration affects outcomes for students who would otherwise be at risk of failing or dropping out, and who would therefore also face economic hardship, as the gap between educated and undereducated continues to widen.

SECTION THREE: EDUCATIONAL REFORM IN COMMUNITY COLLEGES

This section focuses on CTE-based and broader reforms at community colleges, the site of postsecondary career and technical education. We begin by noting some differences and similarities in risk factors between high school and community college students. Then we briefly explore the history and mission of the community college, the economic returns of community college CTE programs, and reform efforts at the community college level, both driven by legislation and by other trends in postsecondary sub-baccalaureate education.

Community colleges are an important site in which to examine outcomes for at-risk students for several reasons. First, many at-risk students who continue their education do so in the sub-baccalaureate institutions variously known as 2-year colleges, technical colleges, and community colleges. Second, a general consensus exists that some postsecondary education is necessary for economic self-sufficiency; thus, any attempt to improve the life chances of at-risk students must include an examination of community college career and technical education.

There is little empirical research at the postsecondary level on outcomes for at-risk students. One problem is nomenclature, e.g., if students are attending a community college, they have usually graduated from high school and are no longer "at risk" in the traditional sense of "at risk of failing to graduate from high school." Another problem is the identification of at-risk students at the community college level: in the K–12 system, the traditional definition of at-risk students includes high poverty, indexed by participation in free or reduced-price lunch programs. There is no such index at the community college level.

Many of the students enrolled in community colleges today, however, can be considered to be at a later stage of risk. These include students with limited English proficiency or students receiving remedial education so that they can then enroll in the college's occupational or transfer programs. Remedial courses rarely grant credit, or if they do, it is often offered only for "institutional credit," which is recognized by the college, but does not count toward attainment of a degree. An average of 36% of students enrolled in community colleges in 1998 were enrolled in at least one remedial course, and this percentage jumped to 95 percent at some colleges (Shults, 2000). This high percentage is often found in our inner cities, where the quality of secondary education lags behind that of more affluent suburbs, and where many of this nation's immigrants and minorities live. Research has shown that freshman enrollment in remedial courses is higher in community colleges with high minority enrollment (U.S. Department of Education, 1998).

In high schools, the outcome of being at risk is often failing to graduate. Unfortunately, data on dropout rates at community colleges are difficult-to-impossible to collect because many students are part-time, and others "stop out," or discontinue their attendance temporarily, only to resume again when time and circumstances permit.

As with high school students, minority status is also an indicator of risk of educational failure. Just under half of all African American and Native American students enrolled in higher education attend community colleges; just over half of all Hispanic students in higher education are enrolled in community colleges (American Association of Community Colleges, 1999). Although community colleges continue to serve more White students than the other groups combined, the

number of White students attending community college declined by almost 6% from 1992 to 1997, while the percentage of minority students grew (Phillippe, 2000). Thus, community colleges are and will remain an important rung on the ladder to success for many students from diverse backgrounds.

History and Mission of Community Colleges

Community colleges occupy a special place in the nation's education system. They are a concrete manifestation of our democracy, because they provide open access to postsecondary education at a low cost. Public institutions like community colleges do not exist in most other countries—they are uniquely American in design and goals. Students who were at risk of failing in high school but persisted and want to continue their education can attend community college and later transfer to a university. These and other students can enroll in occupational programs that lead to semiprofessional positions, such as health care technicians, allowing for a more comfortable life than would be possible with a high school diploma alone. Adults return to the community college at various junctures of their lives for academic, occupational, or recreational courses or programs. In fact, it is this orientation to the entire community that gave 2-year colleges their generic name, community colleges (Ratcliff, 1994). While names like junior college and technical institute are still used and focus on two of the missions of 2-year colleges, in this review we will refer to all 2-year institutions as community colleges.

In 1862, the Morrill Act was passed, which gave land grants to states to start colleges specializing in agricultural and industrial arts. These were more practice-oriented institutions than existing universities, but they were still 4-year institutions. By 1896, the first junior college was founded, to provide the first 2 years of university curriculum at cheaper and more geographically accessible institutions (Lorenzo, 1994). Many of these early junior colleges were extensions of the private universities. The first public community colleges began in the first decade of the 20th century. These were mostly transfer institutions, although some were technical institutes (Ratcliff, 1994).

In 1917, the Smith-Hughes Act provided federal funding for secondary and adult vocational education, often known as occupational education at the postsecondary level. The definition of occupational (vocational) education specifically excluded any program that gave credit toward a baccalaureate degree. Because the community colleges of the time were largely transfer institutions, they were ineligible for Federal vocational education funding.

During the 1930s, community colleges began to promote their occupational education programs. As this mission of the community college grew, the open and democratic nature of the college became more evident. Students who did not have a baccalaureate degree as a goal could still attend college, and receive an education "to enable them to earn a living and to adjust themselves to the progress of the world" (Snyder, 1930, cited in Pedersen, 1994). By 1963, with the passage of the Vocational Education Act, community colleges became eligible to receive Federal funding. This act was reauthorized several times over the next decade, again excluding courses that could lead to a baccalaureate degree. Since then, the Perkins Act has replaced the other legislation, with it programs remained in place.

As community colleges have evolved, they have broadened their mission; the current mission of the community college is multifold. Cohen and Brawer (1989) identified the five most common

components: transfer education; career or occupational education; general education; remedial education (the largest in terms of enrollment); and community education (usually non-credit). Because they serve students of all ages, ability levels, and goals, community colleges are the most comprehensive of postsecondary institutions. In terms of high-poverty or minority students from urban locations, many are placed in remedial programs to upgrade their academic skills, after which they can continue their education in either the transfer, occupational, or general education areas.

Historically, some community colleges have focused on their transfer mission, while others placed emphasis on their associate degree and technical programs. Currently, the benchmark for community colleges is to accomplish all of their multiple missions within tight budgetary constraints. In addition, new missions arise as community needs develop. For example, many community colleges now offer customized training for businesses, in which course content, location, and scheduling are determined by the employer for its employees. Another example is the middle college high school, in which secondary schools are located on the community college campus to encourage articulation and student postsecondary planning (see above).

While the community college is uniquely American, so too, is the duality inherent in it—just as some perceive it to be the great democratizer, others see a villain in the perpetuation of class inequalities (Brint & Karabel, 1989; Clark, 1960; Karabel, 1972; Pincus, 1980, 1994). Clark (1960) laid out the argument that community colleges perform a "cooling out" function in American democracy. There is a belief in the ideology of equal access and of people rising to the top on the basis of their aspirations and efforts, regardless of their origins. But not everyone will achieve their desired level, and some argue that American democracy must also have a means of mollifying those denied that achievement without completely destroying their motivation. Clark (1960) saw this "soft denial" (p. 569) or "cooling out" being accomplished in the community college in several ways. First, whereas open access to community colleges gives everyone the chance to attend a postsecondary institution, once there, many encounter standards for performance that they cannot meet. Clark maintained that for such students, failure is inevitable.

Such an analysis of the societal role of community colleges continued for the next two decades. Karabel (1972) echoed Clark's claims that the community college fulfilled "the traditional American quest for equality of opportunity without sacrificing the principle of achievement" (p. 523). Community colleges performed a sorting function for higher education, Karabel claimed, and thus participated in the intergenerational transmission of privilege by channeling working class students with baccalaureate aspirations into mid-level technical occupations.

However, in today's economy, "terminal degree" recipients from community college computer network systems programs (and several other skill-intensive areas like welding) commonly find themselves making more money than postgraduate degree holders from prestigious universities. How one defines success influences one's view of the community college, which performs many functions beyond transfer education and occupational education.

Brint and Karabel (1989) took issue with the stated goals of some of the early proponents of incorporating occupational education into the community college, such as Snyder, above. They claimed that the nature of community college occupational programs failed to prepare students for life in a democratic society, because the curriculum did not educate and enlighten students to

claim their voices and their right to self-governance. This was their worst indictment of the community college, although they also noted that they failed to deliver the promised economic returns.

Subsequent data on the economic returns of community college occupational education programs supported Brint and Karabel's view. Pincus (1994) summarized several studies, concluding first that most community college students did not get jobs related to their fields of study. They did tend to have better jobs and higher income rates than high school graduates who did not go on to postsecondary education, but this advantage disappeared after adjusting for demographic characteristics and high school achievement. Of those who earned an associate degree, men saw no economic advantages to it over a high school diploma, after controlling for demographic characteristics and high school achievement. There were, however, findings of earnings advantages for women.

Other analyses conducted in the mid-1990s began to show different results for the effects of a sub-baccalaureate degree on earnings (Grubb, 1995b, 1999b; Sanchez & Laanan, 1998). Grubb (1995b) analyzed the 1984–1990 Survey of Income and Program Participation data set, finding that both certificates and associate degrees increased the earnings of those who received them. He found that completing such programs was more beneficial than 1 or 2 years of college without a credential, and getting a job related to one's field of study had substantial benefits compared to getting another kind of job. In addition, Grubb found that these economic benefits varied by area of study. For women, their greatest benefits came within the fields of business and health; men saw the greatest benefits by studying business, engineering, and technical fields. A subsequent analysis using more recent data supported these findings, as well (Grubb, 1999b).

Influenced in part by Perkins accountability requirements, new ways of determining the economic benefits of attending community college have been developed. In many states, agencies have linked databases of comprehensive education and employment information. For instance, state labor departments collect quarterly wage record data from employers. Information on earnings is collected by employee social security number (and used by state offices of Unemployment Insurance [UI] in the event that the person should become unemployed). These data can be linked to higher education enrollment and completion data to account for students after they leave education or training. In many states, other agencies such as the U.S. Postal Service, the department of corrections, and the military have also linked their databases. Issues of confidentiality and privacy remain to be resolved, but this method is becoming increasingly accepted as the best way to assess students' post-college earnings (Sanchez & Laanan, 1998). However, it is incomplete insofar as its ability to capture self-employment and employment in the public sector in those states that do not link their databases with other state agencies, as well as those who move out of state (Bailey & Kienzl, 1999). In addition, using UI data works best for traditional students—those who attend full-time and then go to work full-time. As will be described below, this does not describe the typical community college student any longer, if it ever did, and there are concerns that relying on UI data for accountability could underestimate the effectiveness of community college occupational efforts (Bailey & Kienzl, 1999).

Indeed, post-college income is only one of the measures of accountability required for Federally funded programs in the Perkins Act of 1998 (Perkins III). Others will be described below, but as Sanchez (1998) noted, earnings gains alone are not a sufficient base upon which to make comparisons of colleges, given regional s own various reauthorizations. In all cases,

however, the prohibition against baccalaureate economic differences and college program differences. Post-college earnings gains reported at the college level have little value for specific occupational programs at a given college. Notwithstanding the shortcomings, however, the linking of these state databases represents an important step forward in the attempt to assess the economic benefits of a community college education.

During the 1990s, then, the more negative critiques of the societal role of community colleges waned. As the economy became more global and the perceived need for workers to become more educated increased, attention shifted to improving education at all levels. As Zeiss (1994) explained, "Our preoccupation with ideologies and their defense will transcend to increasing concern about our standard of living and overall economic health" (pp. 508-509).

Legislation-Driven Reforms at Community Colleges

Perkins II

As noted above for high school vocational education, the Perkins amendments of 1990 (Perkins II) mandated that states develop performance measures to be implemented by postsecondary recipients of Perkins funds. The measures focused on student outcomes in the same six areas as the secondary measures (see above). During the 1992 NAVE Omnibus Surveys, state postsecondary occupational education agencies reported their intentions with respect to relative emphasis on these measures (Stecher et al., 1998). Compared to high school vocational education, they reported less emphasis on the skills measures and more on job placement and wages or job retention. This was a sensible approach for institutions offering programs leading to employment. With the passage of Perkins III in 1998, the four core indicators of performance cited above for secondary vocational education became the coin of the realm in the assessment of all vocational education. These will be discussed below in the Accountability section.

Postsecondary Curriculum Integration

Community college course requirements for certificate and associate degree programs usually include academic coursework; part of their accreditation process as a degree-granting institution requires that they offer a general education as well as specific occupational training. Thus, there is an English requirement in many business programs, and a biology requirement in health occupations programs. Because of this, many community colleges think of their curriculum as "naturally integrated" (Grubb & Kraskouskas, 1992). However, academic and occupational components are rarely found in the same course. Such integration is quite rare in the community college, although there are examples, and Perkins II and III provided some motivation to integrate curricula.

Grubb and Kraskouskas (1992) and Grubb and Stasz (1998) surveyed community colleges and technical institutes to ascertain the level of curriculum integration being developed. Although both of these surveys were conducted less than 1 year after the 1990 Perkins II amendments went into effect, some trends were evident. For example, those states that relied on Perkins funding for a large portion of their postsecondary occupational education resources were more likely to have engaged in integration activities than were other states (Grubb & Stasz, 1998).

Grubb and Stasz (1998) identified the following eight models of integration at the postsecondary level:

1. General education requirements, which, as described above, do not integrate within one course. This was the most common activity associated with curriculum integration.

2. Applied academics courses, such as Technical Writing or Business Math. Such a model is usually only presented to occupational students, and thus isolates them from transfer students and others in the general education courses.

3. Incorporating academics into occupational courses, such as a Writing Across the Curriculum strategy, in which writing or another academic skill is infused into occupational courses.

4. Incorporating academic modules into expanded occupational courses. This model is rarely found, because it takes faculty collaboration and resources. If either of these components disappear, so, too, do these types of courses.

5. Multidisciplinary courses that combine academic perspectives and occupational concerns, such as The History of Technology or The Role of Work in Society. These hybrids are often difficult to identify as either an academic or an occupational course.

6. Tandem or cluster courses are taken simultaneously, allowing for teacher collaboration and joint projects. These often create small learning communities, in which students report being more motivated and knowing their classmates better, which often leads to fewer dropouts.

7. Colleges within colleges are the postsecondary analogue to high school academy structures. They are expanded versions of cluster courses in which groups of related courses, instructors, and students form a small learning community. These are very difficult to achieve at the postsecondary level due to the various commitments community college students have to work and family.

8. Finally, many community colleges reported integrating occupational themes into their remedial and English as a Second Language programs, which are essentially basic academic skills courses.

As can be seen, these models reflect very different conceptions of integration and the desired level of change, and faculty collaboration necessary to achieve it. The most common models in use were Models 1, 2, 3, and 8. Grubb and Stasz (1998) found the high reliance on off-the-shelf materials disconcerting because they are often not as "applied" as the name implies. In addition, many of them had not been well evaluated, and they did not require teacher collaboration or any changes in the way subjects were taught.

The most thorough forms of integration are Models 5, 6, and 7—the hybrid courses and the course clusters. Both of these models require reshaping occupational programs, and they rely on faculty collaboration. However, they are rare, and both Grubb and Kraskouskas (1992) and Grubb and Stasz (1998) found a great deal of unwillingness on the part of faculty to engage in these sorts

of integration activities. Academic teachers felt that it would "water down" their discipline, and both academic and occupational faculty worried that it would leave them less time to cover what each felt was necessary subject matter. Faculty also cited a lack of sufficient time and funding to support collaborative curriculum development. It seems that as distant as high school academic and vocational teachers are from each other, the distance is even greater at the community college.

Grubb's strong support for curriculum integration at both the high school and postsecondary levels comes despite any hard evidence that it is an effective means of engaging students and improving their achievement or outcomes, as noted in the high school section above. However, he points to several reasons why it should be given time to prove itself. First, employers claim to want workers with better academic skills, not better job-specific skills. Second, curriculum integration provides the education for citizenship that critics of community college occupational programs claim is missing from them, e.g., a Role of Work in Society class will discuss the history of the labor movement, the ills of unbridled capitalism, and other topics that strict worker training programs do not. Curriculum integration would avoid preparing "technopeasants" (Hersh, cited in Grubb & Kraskouskas, 1992)—workers who are technically qualified but otherwise unable to participate in a democratic society. And, finally, curriculum integration can help lower the barriers between academic and occupational faculty.

Accountability

According to Orr (1998), the transfer mission of community colleges is on the decline, while the occupational education function continues to grow. Such growth requires accountability, which became an important emphasis in the two most recent reauthorizations of Federal funding for vocational education. For instance, Perkins II outlined several performance measures to be tracked by community colleges, including new areas of accountability for occupational programs such as academic outcomes of occupational students.

Prior to the Perkins laws, community college occupational programs typically used job placement and program completion as measures of effectiveness (Bragg, 1995). But state demands and changes to the postsecondary accreditation process have influenced accountability reporting. Now community colleges are likely to incorporate indicators based on their mission statements, and may even include "authentic" measures of student outcomes, such as portfolios and performance assessments. Many community colleges have also instituted new assessment systems independent of these external forces, as a response to their changing populations. Due to all of these forces, many community colleges developed an institution-wide assessment strategy, rather than one system for occupational education, a different one for transfer education, and so on (Bragg, 1995).

It is interesting to note that Perkins II did not include transfer rates as an outcome measure—likely a result of its emphasis on pre-baccalaureate education. This, along with the fact that Perkins funding only accounts for a small portion of a community college's budget, may be why the Perkins II mandates had only minimal influence on the accountability changes that have taken place at the community college level (Bragg, 1995). Officials at the institutions studied by Bragg claimed to want more comprehensive assessment measures than those provided by Perkins II. They preferred broader measures that reflected the reality of all education at the community college level, which included transfer rates. Such realities were soon recognized by Congress as well, and Perkins III included the possibility of measuring transfer rates as an outcomes measure

for postsecondary occupational education. It also authorized tech prep articulation with baccalaureate degree programs for the first time (Bragg, 2000).

School to Work Opportunities Act

The School to Work Opportunities Act did not specify a role for community colleges, and Orr (1998) found little community college involvement in those activities. Some community colleges participated as members of the local partnerships required by the law or as members of workforce development agencies (Orr, 1998), but often agency boundaries did not coincide with community college districts, which hampered coordination (Urquiola et al., 1997). In other cases, the consortia that began under the tech prep initiative of Perkins II "provided the underpinnings" for the STW partnerships under the latter legislation (Bragg, 2000, p. 10), leading to an efficient governance structure for workforce development, made up of business and education. In some localities, the coordination worked better than in others. Bragg (2000) found that in those areas where youth apprenticeship programs operated, the coordination appeared to work better, with the school-based learning that tech prep offered combining well with STW's work-based learning component.

The shift in thinking about tech prep from being for the "neglected majority" to being for "all students" is a further result of the coordination between tech prep and STW, the latter of which is directed towards all students (Bragg et al., 1997). Additionally, Perkins III allowed for work-based learning opportunities at community colleges to be funded by Perkins money, a recognition of the importance of that STW component for the postsecondary level as well.

Perkins III

Perkins III introduced the same four core indicators to postsecondary occupational education as it had to secondary, as outlined above in more detail. Briefly, they are as follows:

1. student attainment of academic and vocational-technical proficiencies;
2. student attainment of a postsecondary degree or credential;
3. student placement in and completion of (pre-baccalaureate) postsecondary education or advanced training, placement in military service, or placement or retention in employment; and
4. student participation in and completion of vocational and technical education programs that lead to nontraditional training and employment.

The second and third indicators (credential acquisition and the completion of postsecondary education programs) have become somewhat problematic, given current enrollment realities at community colleges. The typical community college student is not a recent high school graduate, and is not enrolled full-time in an associate degree program. The average community college student is 29 years old (American Association of Community Colleges, 1999), attending part-time, and taking only those courses that are needed for their immediate plans—not necessarily following a college-determined plan of study. When their needs are met, these students move on. Many students begin working full-time after high school and incorporate postsecondary education as time and resources permit. Others begin postsecondary study, but are snatched up

by business and industry hungry for qualified people, and the lure of high-paying jobs pulls these students away. Still others attend several institutions in their postsecondary careers. Thus, retention and completion rate measures gathered at any one institution may not accurately reflect the effectiveness of postsecondary occupational education for students in these nontraditional pathways (Bailey & Kienzl, 1999; Grubb, 1999a). This makes it difficult to come to definitive conclusions about the role of community colleges in helping students identify and achieve career goals, including those who were considered at risk in high school, as they will be among those who drop in and out when time and resources permit.

While Perkins III provides for many possible measures of effectiveness, some researchers believe that the addition of other areas of investigation could lead to more effective programs. Grubb, Badway, Bell, and Castellano, 1999, and Grubb 1999a list several:

1. an understanding of the local labor market and appropriate targeting of training opportunities in those areas;

2. an appropriate mix of academic and occupational subject matter, as well as work-based learning opportunities;

3. support services such as remedial education, guidance, and retention programs;

4. connections to other programs, such as tech prep, as a pathway from high school to the community college, and pathways to further education, such as linkages to 4-year colleges; and

5. the collection of information about the results of programs and the use of this information to improve programs.

These areas are analagous to the kinds of reforms required at the high school level to improve outcomes for at-risk students. Yet they are rarely implemented at community colleges, and colleges incorporating all of these strategies are almost non-existent (Grubb, Badway, et al., 1999). Much more research is needed in these areas. Such research would necessarily be conducted at the program level. Qualitative studies of programs identified as successful could provide useful information on how local labor market needs and possible "next steps" for students are considered in the design of programs. Exemplary pedagogical, curricular, and support service practices could provide models for dissemination to other contexts. Finally, an examination of how successful programs use outcomes information to improve their programs could help others develop their own systems of continuous improvement.

Non-Legislation-Driven Reforms: Other Postsecondary Trends

Given the comprehensive nature of community colleges and their multiple missions, it is not surprising that their priorities with respect to reform are wide ranging, and that their reform trajectory does not mirror that of the K–12 system. Although they may inform one another, the two educational systems were not designed to coordinate closely, and attempts to do so have been difficult (Bragg & Layton, 1995; Orr, 1998). A recent survey of community college faculty shows that in addition to having weak linkages to the K–12 system, many faculty members have not developed strong ties to local labor markets, nor is there institutional support for them to do so (Brewer & Gray, 1999). A recent study of teaching at the community college revealed that

despite their reputation as "teaching institutions" (as opposed to the research-orientation of a 4-year university), many community college faculty members know very little about pedagogical theories and trends, and they get little or no support from their institutions to address this shortcoming (Grubb, Worthen, et al., 1999). One reason for these failings is the adjunct/part-time nature of community college teaching: many instructors are not tenured faculty, or they teach at several institutions and do not have a "home base" from which to operate. Because their status is tenuous, they tend not to voice too many demands. However, reform at the community college is proceeding according to its own internal logic. Below are some examples of innovations taking place at the community college.

Curricular and Pedagogical Reforms

Some of the innovations in curriculum and pedagogy at the community college level parallel those at the secondary level. As we have seen above, many colleges are involved in integrating academic and occupational curricula, and in developing linked courses or learning communities to address the isolation felt by both students and faculty. Others are involved with high schools in tech prep consortia and School to Work initiatives that require close curriculum coordination.

Although this movement is not extensive, some community colleges are addressing the need to contextualize their instruction. They are incorporating into their knowledge and skills delivery an understanding of how that knowledge is used in life beyond school (Badway & Grubb, 1997; Grubb, Worthen, et al., 1999). They are also changing the content of their courses so that they are more useful to students, matching the teaching and assessment approaches with how knowledge will be used outside the school, and organizing programs and schedules to be flexible and responsive to the needs of today's students. This means that they are offering these comprehensive and contextualized courses in "chunks," or clusters that allow for easy access, i.e., open entry/exit, variable duration to meet the needs of students (Badway & Grubb, 1997). Other innovations in curriculum include capstone projects completed by students. These are similar to senior projects in high school, requiring library research as well as investigations in the community or target industry. They are presented at the end of a course or cluster as an illustration of what the student has learned, and they are often evaluated by industry representatives.

In addition, distance learning has grown exponentially in the last few years. Students physically located in a remote classroom may take classes from a community college via television monitors and voice-activated microphones. This technology has ramifications for course offerings, for competition from other institutions, as well as for pedagogy. In the best of circumstances, the technology is interactive, allowing for discussion that transcends physical location, but the minimal research that has been conducted thus far suggests that the traditional lecture format continues to dominate distance learning practice (Grubb, Worthen, et al., 1999). Thus, the usefulness of distance learning for occupational programs, which rely on hands-on pedagogies, is unclear.

The Entrepreneurial College

Many community colleges caught the entrepreneurial spirit so prevalent in the business world in the 1990s, and used it to seize opportunities to offer more services to business and the community at-large (Deegan, 1994; Grubb, Badway, Bell, Bragg, & Russman, 1997). Entrepreneurial management at community colleges creates a climate in which innovation is encouraged through "venture capital" funding, rewards, and incentives to staff who undertake new initiatives (Deegan, 1994; Zeiss, 1994).

There are several examples of such initiatives (Grubb et al., 1997), including customized or contract training, in which an employer, rather than a student, is the "client." Employers determine the content, scheduling, and location of the training, usually for their employees. Another example of community college entrepreneurship is serving as incubators for small businesses, or testing centers for new technologies. Given the needs of business for highly trained employees, and of community colleges for students, businesses and community colleges have both recognized the value of engaging in such partnerships (Zeiss, 1994). Many community colleges are also involved in chambers of commerce and local workforce development boards, whose duties include attracting new business to the area. Other types of entrepreneurship involve participation in community development projects such as local task forces on social issues (Grubb et al., 1997).

Entrepreneurial activities usually do not include large numbers of staff or students, nor do they threaten to overtake or replace the traditional missions of the community college. They do bring in extra resources, which are sometimes put into discretionary funds, adding to the fiscal stability and flexibility of the colleges (Deegan, 1994; Grubb et al., 1997). Still, there are tensions. Some opponents of entrepreneurial activities may have misgivings about the growth of the for-profit, pro-business mission. They argue that community colleges should be more than simply job-training facilities. Among the other functions of a community college are the communication of citizenship values, cultural appreciation, and an awareness of human relations in a diverse society. Others counter that the community college can enhance its image in the community (which can increase regular enrollments) by becoming indispensable to business and regional economic vibrancy. Each community college needs to acknowledge this tension and become equally comfortable with its citizenship and job preparation roles (Grubb et al., 1997).

Although these innovations are clearly significant, there appear to be fewer advances in the more traditional areas of the community college (primarily transfer, career, and remedial education) than are occurring in the entrepreneurial areas (Grubb, Worthen, et al., 1999). Many pedagogical innovations are introduced by faculty on an individual basis, rather than being presented and supported by institutional leadership. Orr (1998) rightly noted that many community colleges have not responded to the innovations currently underway in K–12 education. Community colleges, if they are to retain the label of "teaching institutions," must examine their pedagogical practices and the ways in which they keep their faculty current on pedagogical trends. Such an examination will likely lead to changes in assessment and governance practices, as well (Grubb, Worthen, et al., 1999).

These changes need to be undertaken with attention to the fastest growing segments of the community college clientele: students older than recent high school graduates; those students unlikely to complete a degree or certificate program for various reasons; and, in many cases,

students meeting one or more of the risk conditions for failure or dropping out of the community college.

Summary of Educational Reform in Community Colleges

The future of community colleges and their unique mission looks bright. From 1970 to 1997, the number of people earning an associate degree grew at a faster rate than the number of people earning any other postsecondary degree, and associate degree conferrals are expected to keep pace with or exceed those of other postsecondary degrees through 2007 (U.S. Department of Education, 1999). In addition, from 1998 to 2008, jobs requiring an associate degree are expected to grow at a faster rate than those in any other educational level (U.S. Department of Labor, 1999). These facts make a strong case for a concerted effort to include all segments of our population in this attainable and attractive means of achieving a viable economic future.

Although perhaps not as much as other kinds of postsecondary educational institutions, community colleges are nonetheless inherently conservative and averse to change in response to changes in the society around them. This is obvious in the tepid approach to curriculum integration, where only the more superficial forms are commonly found. It is also reflected in the minimal changes to occupational curricula as a result of tech prep collaboration with high schools. There is a growing consensus that the first 2 years of postsecondary education should be more closely tied to the compulsory years of schooling. High schools are expected to change their courses to meet community college expectations and requirements, whereas the converse is much more rarely seen (Orr, 1998). Some critics believe that the community college's inattention to the professional development needs of its faculty, perhaps especially the occupational faculty, must change if the reform movement of the K–12 educational system is ever to take hold at the community college.

As with high school vocational education, Perkins III offers community colleges the opportunity to implement fundamental change and holds them accountable for results; so as studies of Perkins III outcomes emerge, we will begin to see the effect of such reforms on community college occupational programs. In addition to large-scale outcomes studies, qualitative case study research of community colleges with exemplary occupational programs that are aligned with their feeder high schools and that have heeded calls for reform in pedagogical and assessment practices are much needed (Bailey & Kienzl, 1999). There is not enough attention paid to these issues at the community college level, but this must change if the current rhetoric is true—that most or all students will need some postsecondary education in order to achieve a comfortable standard of living. Research is needed to find and disseminate the best practices so that those students get a quality education that is worth their time, money, and effort.

The pedagogical innovations described above are rare, and even where they are being practiced, there is the concern that the motives are more economical rather than pedagogical (i.e., it is cheaper to tape an instructor's course or broadcast it to many sections than it is to pay the instructor to teach it again). Grubb, Badway, et al. (1999) warn that such motives tend to degrade instruction to the lowest common denominator, rather than using innovation to improve pedagogical practice.

Finally, community college funding continues to be an issue of contention—many believe that community colleges should have a source of Federal funding that is separate from Perkins (and

secondary school funding), and separate from university student grants and loans, as well (Grubb et al., 1997; Rosenfeld, 1999). If community colleges truly provide types of education not found in other institutions, they should be supported in these unique roles.

Leadership is needed to build the vision of greater integration with the secondary school system, to secure sufficient resources to fulfill the multiple missions of the community college, and to ensure that instruction becomes or remains the main focus of the institution. This will ensure that students from all backgrounds continue to have the opportunity to receive postsecondary education and training.

CONCLUSION

This review has cast a wide net in an effort to capture the various independent strands of literature that make up the base of our knowledge of how school reforms of different kinds, and at two different levels of education, affect outcomes for at-risk students. Educational risk factors were identified at the student-, family-, school-, and community-level. These risk factors are increasingly important, because the potential impacts of being at risk for educational failure have risen dramatically in the last 25 years.

Secondary education reform in the last two decades has converged around several components. Despite a shortage of hard data on positive outcomes for several of the secondary reform efforts, something approaching a consensus has emerged that a combination of these components does yield positive results. This consensus has come from groups that include school reformers, policy groups, and researchers (American Youth Policy Forum, 2000; Coalition of Essential Schools, 1998; Legters, 1999; Lynch, 2000; National Association of Secondary School Principals, 1996; Visher et al., 1999; Herman et al., 1999). Many of the agreed-upon elements for successful high school reform parallel those found to support CTE reform described earlier. These elements are grouped again here into those that support the structure, capacity, and pedagogy of reforms.

Supports for structural reform:

- Career academies or similar learning structures of small communities that focus on broad career clusters;
- Block schedules or other alternative schedules for longer learning times;
- Vertical integration of curriculum spanning the middle schools, high schools, and community colleges;
- Partnerships with business and postsecondary institutions; and
- Career exploration beginning in the middle school.

Supports for the capacity for reform:

- Interdisciplinary teacher teams with common planning time provided;
- Sustained professional development; and
- Work-based learning opportunities from job shadowing to more intensive forms.

Supports for pedagogical reform:

- High academic standards and student learning supports to meet the standards;
- Authentic assessment;

- Interdisciplinary curriculum that integrates rigorous academics and real-world applications, often with a career focus;
- Project-based learning; and
- Technology integrated into classroom learning and used by teachers to monitor student progress.

For both high schools and community colleges (where applicable), these elements of reform are far-reaching and require a systemic approach to change. A few vocational teachers, or a small group of vocational and academic teachers working together cannot accomplish the fundamental changes called for if U.S. high schools and community colleges are to meet the challenge of preparing today's young people for tomorrow's world.

As an example, a necessary ingredient for this blending of the two halves of the comprehensive high school is adequate professional development for teachers. Perkins III requires current CTE programs that receive federal funding to improve student math and reading skills. Yet the simple reality is that most vocational teachers were hired and trained to teach skill areas. Few were prepared to teach literacy or numeracy. Vocational educators tend to be experts in their field, but most lack pedagogical training in more traditionally academic areas. After decades without a theoretical framework or pedagogy for CTE teacher preparation (Lynch, 1998), groups of CTE stakeholders have begun to address this shortcoming, and have published standards for effective CTE teachers. Most notably, it is now recommended that CTE teachers have at least a baccalaureate degree (Lynch, 2000). Unfortunately, the current Perkins legislation lacks adequate funding to make the fundamental changes needed to CTE pre-service and in-service professional development.

When examples of successful integration of whole school reform and CTE are found, they almost invariably prove to be in schools that have highly talented and dedicated leadership. This makes the reforms difficult to replicate in other sites. Furthermore, assuming the presence of universally unusual leadership (or staff) violates a fundamental principle of Deming's Total Quality Management (TQM). TQM makes the initial assumption that, while virtually all employees are willing workers, they are, on average, typical—not hugely gifted or otherwise heroic. However, reforms must be built through the work of honest, hard-working, but not universally uniquely talented leaders and followers—that is, the perfectly honorable people working in real schools.

The components for reform listed above have been implemented to a much larger extent in high schools than in community colleges. This is partially because despite local control, high schools across the country are quite similar. They all answer to local districts and school boards, so some governance issues and hence, avenues for reform, are relatively well-understood by the public and stakeholders. On the other hand, community college system governance structures vary in their degree of centralization from state to state (Garrett, 1993). They are much less well understood by the public, and particularly among people in leadership positions. While virtually all people in leadership positions attended a high school, the same is not true for community colleges. Thus, although many of these reform elements would improve teaching and learning at the community college as well as at the high school level, the impetus for change is weaker at the community college level. At the same time, community colleges must also grapple with responses

to an economy changing from manufacturing to services and information. They must respond to a more diverse student population as well, meaning that they must explore more diverse methods of organizing, teaching, and assessing students. Many community colleges are taking note of the changes taking place in the secondary schools, and adopting some of the elements, as well.

Most school personnel realize that in the current climate of higher standards and expectations for students, where a school's progress is publicized in newspapers and on the Internet, all students must be provided with literacy, numeracy, and computer literacy instruction. This includes CTE students, who in the past could be marginalized without concern over external sanctions. The future for America's most at-risk high school students lies in the reliable co-construction of reform (Datnow & Stringfield, 2000; Datnow et al., 1998), in which individual schools work with reform design teams and district administrations to arrive at and implement a combination of elements that will work in their contexts. This is especially true in high-poverty urban contexts, where human capital is already scarce (Balfanz & Legters, 2001). Creative collaborations between local schools, their district-wide and program-specific administrators, and design teams hold great promise for urban areas, which can capitalize on the expertise of the team and co-construct a reliable approach specific to their conditions.

The job ahead looms large, but now is an exciting time to be working in the field of education precisely because it is in transition. It is also an important time to conduct research, to capture the processes and outcomes of this transition. What is now needed are outcomes studies to see whether and how various combinations of these reform elements work, in what kinds of contexts, and if anything needs to be re-tooled. Thus far, research has been minimal on many of the reform elements and designs. We believe that longitudinal studies would be best able to discern the results of the changes ahead, since changes take time to work through any system, and results (student outcomes and post-high-school choices) would only appear over time. The focus for these studies must be on high schools and community colleges in poor or minority communities, because education more or less works for the more advantaged sectors of society. Parents in the more advantaged sectors of society will make sure that the privilege of college education is passed on to their children. These reform elements need to be tested to see whether they indeed make a difference in the lives of the underprivileged, for their numbers are growing as a percentage of our population and their calls for equity must be met if we are to live up to our nation's ideals.

IMPLICATIONS FOR ADDITIONAL RESEARCH AND FOR PRACTICE

Implications from this review can be divided into implications for research and implications for practice. Each of these is briefly described in this final section.

Implications for Additional Research

The important intersection of school reform and CTE in high schools is seriously understudied. The same can be said with respect to reforms and their outcomes in community college CTE programs; in fact, the nature and scope of reform efforts in community colleges remain relatively unknown. The gaps in the knowledge base are such that suggesting additional research is easy, yet easily overlooked. One possible source for funding this research is the Perkins legislation. A simple 2–3% addition to Perkins for research would net between $34 million and $51 million, and would benefit the field immeasurably. Possible directions for this research follow.

1. The field is badly in need of a set of overlapping studies of diverse efforts at high school and community college reform. As Cronbach et al. (1981) pointed out so clearly, an overlapping set of studies, each with a slightly different lens and set of methods, is almost invariably more valuable than a single "would-be definitive" study. Some of these studies have begun at the National Research Center for Career and Technical Education. Many more are needed.

2. Several of the studies should be longitudinal, and employ mixed methods (Tashakkori & Teddlie, 1998). To have ecological educational validity, the methods should match the realities of constructs being investigated—in this case, the long-term effects of diverse CTE reforms on students. These effects must include standardized test scores, graduation rates, and postsecondary transitions for high school students, and completion rates, transition to work rates, and employment rates for community college students.

3. Wherever possible, studies should take advantage of naturally occurring experiments. When reform is happening and appears to be succeeding, local and national funding should be directed toward close examination of what parts of the effort are succeeding, and why.

4. Funding should be increased for current and future secondary reform designs that incorporate CTE as central to their mission. As the research literature builds, the potential exists to summarize research into practical reforms for formal testing. For example, Success for All/Roots and Wings (Slavin & Madden, 2001), an elementary school reform design, began with a "best evidence synthesis" of research on beginning reading. It moved rapidly to field trial, and to increasingly large efficacy studies. The same can happen, funding permitting, in CTE. All funding should be tied to specific agreements to participate in proactive, longitudinal studies with a focus on student outcomes.

5. Studies should be conducted at diverse levels and from diverse perspectives—student perceptions and outcomes, classroom processes, school and district leadership, micro- and macro-political perspectives. All will be important in moving the field to a more scientific and more effective level.

None of these studies will be inexpensive, and all will take time. However, the CTE field specifically, and educational reform generally, have spent decades waiting for "best practice" to trickle throughout the system, and NAEP data strongly suggest that this method has not worked. We need to invest in more research, and this review can help guide future directions.

Implications for Practice

1. *Collaborate across departments and traditional areas.* A clear conclusion from prior research is that the aggressive goals of Perkins III, including raising basic skills achievement scores, can only be accomplished by cross-disciplinary teams. CTE teachers, regardless of how hard-working or well-intended, will be very hard pressed to make a dent in this issue on their own. By contrast, whole schools, working in coordinated fashion, have an excellent chance of achieving Perkins III goals.

2. *Provide joint professional development.* This is important for two reasons. First, most CTE teachers, like most secondary school teachers of subjects other than remedial reading and mathematics, are not trained to work with students on improving basic skills. Most secondary teachers, including CTE teachers, will require additional professional development in order to meet the Perkins III goals. Second, shared professional development is an excellent way to further cross-departmental communication and collaboration.

3. *Incorporate career-based learning into more secondary schools.* Academies, pathways, magnets, as well as some of the reform designs reviewed here, provide students with opportunities for education through, about, and for work. Educators are learning to integrate careers with academic subjects as a hook to retain students in school, to improve their academic skills, and to help them make the transition to college. All schools should consider this means of helping students meet the higher standards expected of them and identify their own goals for adult life.

4. *Explore external designs and, where appropriate, engage with external partners (HSTW, NAS, TDHS).* Research on school reform indicates that, in more instances than not, local efforts to reform schools run out of energy during their planning year and do not achieve implementation. External design partners have been through the school change process hundreds of times, and can be of great assistance in helping schools move in purposeful, research-proven directions right away. Also, as outside agents, they have few or no ties to any local disagreements unrelated to improving student achievement. High Schools That Work and Talent Development High Schools are merely two examples of reforms that have been demonstrated to improve student achievement in multiple contexts.

5. *Seek out opportunities with district evaluation offices and/or local universities for conducting open evaluations and research on what is, and what is not, being implemented.* Regardless of the reform chosen, if it does not involve continuous feedback and self-assessment, it will eventually die. Most school districts have local research and evaluation offices. Virtually all universities have researchers interested in "real world" projects. Schools that can connect with these additional resources are more likely to continue a process of self-assessment and self-improvement.

6. *Ramp up pedagogical and other reform efforts at community colleges.* The K–12 system reform movement is slowly reaching higher education as well. Community colleges cannot continue to provide traditional instruction and assessment to their students, nor can the leadership ignore changes in K–12 governance structures. The historical arrogance of postsecondary education with respect to secondary education will seem misplaced and anachronistic if leaders disregard the movements for reform and accountability taking place in the K–12 system, and refuse to change in analogous ways. There are pockets of innovation in community colleges, and the time has come to acknowledge, support, and disseminate innovation throughout the community college system.

Together, these research and practice reforms offer the best current chance at meaningful long- and short-term educational improvement for students who do not attend 4-year colleges and universities, and, indeed, for all students. We should move toward them. Our young people deserve no less.

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